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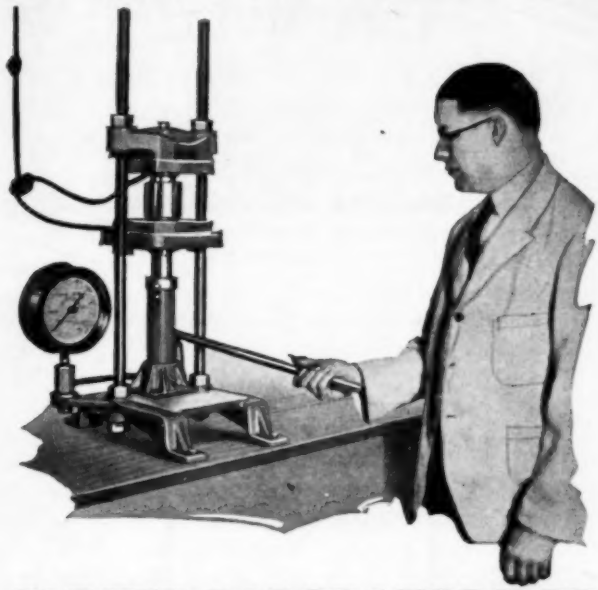

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EDITORIALS

Controlled Enthusiasm

THE Junior Science Clubs, sponsored by the American Institute of the City of New York, are doing fine work in teaching the young students not only what science is accomplishing but where it is leading; but we wonder whether there is not some danger involved, unless there is further education. "A little learning...."

Young students, watching as highly intelligent and interesting a chemical lecturer as Dr. Ross Baker, are likely to be filled with an enthusiasm for chemistry which may grow into a decision to take up chemistry as a life work. In not all of the cases will such a decision be the wise one.

If the student's interest carries him through a year or two of college chemistry, no harm can possibly be done. The time will be well spent from a cultural standpoint alone. But there ought then to be introduced other information, of a professional as well as a technical nature. What are the prospects from the study of chemistry? Is the profession overcrowded? What are the chances that some of its members will have to take up other work in the readjustment necessary when any profession falls into a state of technological unemployment?

At the present time, except for an occasional study by an individual chemist, there is no answer to these questions. Every chemistry professor, of course, tries to answer them in a general way for his students; but there is no source of authentic information, no agency compiling figures. A professional employment agency would be able to investigate these questions, and working in conjunction with a powerful professional organization it could answer them.

In one of his examples in *A Bubble That Broke the World*, Mr. Garet Garrett points out that capital is destroyed if it is invested in shoe machinery after the margin of profitable vendibility for shoes has already been reached. Similarly, time and money spent in learning a profession (as distinct from a general education) may be time and effort wasted, depending on the situation in the profession.

Theoretically there cannot be too much knowledge or too much scientific research; but, actually, there are in the world at any one time only a certain number of research organizations, colleges, industrial laboratories, and promoters of profit-making industrial research. When

these agencies have employed all the chemists they can use, a saturation point is reached.

Too efficient a ballyhoo for any profession will in the end do harm unless this advertising is genuinely efficient in telling everything about the profession. We are not advocating at all that Dr. Baker ought to break a few beakers, or that a less lively and interesting lecturer should present the subject. We simply feel that his fine introduction should be followed up later by other work which will give a complete story. Such further work ought to be one of the functions of the professional organization—in this case The American Institute of Chemists and the employment bureau we hope we shall some day have.

Eligible Chemists

DR. D. D. JACKSON, chairman of the membership committee, tells us that fourteen Fellows of the Institute have proposed 152 friends of theirs as men who are eligible for Fellowship in The American Institute of Chemists. Eighty of these chemists were known personally to members of the National Council, who seconded the proposals.

The remarkable thing about the list is that in the entire 152 names there were only three duplications. (And one contributing editor of THE CHEMIST suggested another of the contributing editors as a man well qualified to be a member of the Institute.)

Finding such a large group of non-overlapping names surrounding fourteen of our members indicates that there may be more chemists eligible than we supposed. One estimate of the total potential Fellowship of the Institute set it at 3800; another at 6000. If the situation in the whole country is anything like that in regard to these fourteen of our members, 6000 is too low an estimate—a fact which we are delighted to discover. The more high-class men there are in the profession, the more influential it can be; and the less difficult will be the task of persuading the public and legislators that professional status for chemists is something which will benefit the country as well as the profession.

It must be remembered, however, that the Institute will be immensely useful to each member not when it has doubled its present membership but when it includes a working majority of the eligible chemists of the country—in other words, when it has reached the position with respect to chemists which is now held by the American Medical Association as regards doctors. Judging from the list of new members on page 863 of this issue of THE CHEMIST, that time is not far away.

Chemical Warfare

WE ARE printing in this issue of THE CHEMIST an article by Dr. Mitchell Fain pointing out that the various war gases are not really so terrible; but we are not at all sure that in giving publicity to such a statement we are doing the public a service. The superstitions about the future terrors of chemical warfare were firmly grounded, and they may even have been a good thing. A friend of ours who is a brilliant man and a Ph.D. believes implicitly that a drop of Lewisite, falling on the knee of a sitting man, would eat all the way through his leg to the ground. Whether it would then go on eating its way through the ground to China, he doesn't know. This Ph.D. is, however, firmly opposed to all jingoistic policies.

A really lethal war gas, one that would scare the civilians, would be a fine deterrent to war as a means of settling international disputes. We personally are already pretty much opposed to war, mostly because we have watched at close range the effects of modern artillery. As soon as any one started shooting at us with high-explosive shells we would be frightened, probably literally, to death; and the very thought of being bombarded makes us vote as hard as we can for legislators who are in favor of settling international squabbles by arbitration. Unfortunately not everyone has watched artillery in action; nor is everyone in a fighting nation exposed to artillery, or even to air bombs.

It was a German soldier, Erich Maria Remarque, who described the German burghers discussing over their beer how they would partition France when the imperial armies had conquered. Would they have backed a war of conquest so whole-heartedly if they had known that at any moment a plane might fly over and put an immediate and uncomfortable end to them and to their imperialistic dreams?

The Superstitions about Chemical Warfare

By J. Mitchell Fain

The background of the popular prejudice against chemicals as a weapon. Sensational magazine articles. The facts about Lewisite. War chemicals of the future.

THE use of chemical agents in warfare meets with opposition from a great many people, largely because of the propaganda disseminated during the World War. At that time there was a purpose in arousing antipathy to war's newest weapon. Germany, a signer of the Hague agreement renouncing harmful gases, had initiated gas warfare and by its use had scored important victories. The Allies, totally unprepared, had suffered many thousand casualties. Against this new form of warfare adequate means of protection were not available, and it therefore seemed more terrible than the others. The Germans were held up as enemies without principle, and the fearsomeness of the new means they had employed was effectively advertised. When the war was over and the proper evaluation of chemical agents as a weapon had been made, few people felt the need of acquainting themselves with the facts. Feature writers for Sunday newspaper supplements and for popular magazines still see in chemical warfare a source of sensationalism that appeals to readers. When they find their information inadequate, they draw upon imagination.

An anonymous article appearing on January 3, 1932, in a widely distributed weekly is typical of these fanciful effusions. The millions of inhabitants living in large cities are depicted as being completely wiped out by poisonous chemicals dropped from airplanes. The fact is* that the country having the largest air force could not put down a lethal concentration of the most effective known chemical over an area greater than a square mile, provided all its planes were used in the attempt and all the planes reached their goal. New York's area is approximately 300 square miles.

This lethal concentration, furthermore, would extend only 20 or 30

* Report of Lieut. Col. Porter H. Murphy, C. W. Reserve.

feet from the ground. A room on the upper floors of New York's large buildings would serve as a gas refuge. The air conditioning systems of large theaters and other buildings can readily be transformed to remove noxious gases and smokes. People would be accommodated quite comfortably in these edifices during an attack on even the most congested centers. Imaginative statements to the contrary notwithstanding, cities and the war materials which they supply will be destroyed in the future as in the past with greater efficiency and at lower cost by high explosives, either dropped from aircraft or shot from long distances.

The anonymous author states that "no one mask is proof against all gases. To be really safe every form of animal life in cities must be provided not only with a mask, but with an assortment of cartridges or cylinders to use in it, and somehow know which one to use." This is absolutely without foundation. The army gas mask of today is equipped with a canister which affords protection not only against smokes but against every other type of chemical agent so far found practicable for military purposes.

Other Opposition to Chemicals in Warfare

The opponents of chemical warfare have likewise drawn support from certain professional soldiers. The reason for their feeling in the matter is a curious one—a sentimental attachment to cruel and obsolete killing machines. It is similar to the motive which inspired the conduct of Chevalier Bayard, described by contemporaries as "sans peur et sans reproche." The soul of courtesy to captured knights and bowmen, he invariably put to death musketeers or other users of gunpowder. How much of this sentimentality is fostered by unwillingness or inability to master the technique of the new weapon, it is difficult to say.

With these there are grouped a number of out-and-out pacifists, who object to all war and who apparently hope to make it more difficult by restricting the means of fighting. They often argue against gaseous weapons because of their cruelty. In this they need enlightenment.

Much of the feeling concerning chemical warfare (and much that has been written for popular consumption) arises from ignorance. That this ignorance may have important consequences there can be no doubt, as witness the efforts not to abolish war, but merely an instrumentality of war. It is high time that everyone be advised of the true state of affairs regarding the use of chemicals for military purposes and it behooves chemists particularly to learn the facts in the matter. They,

of all people, are best qualified to judge them. Their opinions should be accurate.

From a strict point of view, high explosives and incendiaries should be included in this category of military chemicals, but so accustomed have we become to consider these in separate classes that they will not be included here.

Classes of Chemical Agents

During the World War there were, according to J. B. S. Haldane in *Callinicus*, twenty-five different poisonous chemicals employed. Of these only three are gases at ordinary temperatures and pressures and can be discharged from cylinders in which they are stored under pressure. The remainder are liquids which gradually evaporate yielding either a poisonous vapor or poisonous solid in the form of smoke. Of the large number of chemical substances whose military value was exploited during the war, only a few have survived. The requirements which these materials must meet are severe.

The Chemical Warfare Service of the United States Army classifies and lists the following as chemical warfare agents.

THE LUNG IRRITANTS.—Chlorine, phosgene, and chlorpicrin. They are regarded as non-persistent, although chlorpicrin is considerably more persistent, albeit less toxic, than phosgene. The symptoms produced by these chemicals are similar: coughing, smarting of the eyes, nausea, and vomiting. First-aid treatment includes immediate removal to a pure atmosphere, wrapping in blankets for warmth, giving of light stimulants, and quiet.

THE LACHRYMATORS.—Chloracetophenone and brombenzylcyanide. These are substances which affect the eyes, causing involuntary weeping. They produce an intolerable atmosphere in concentrations many times more dilute than that required for the most effective of the toxic agents. Both are solids at ordinary temperatures, but the commercial brombenzylcyanide contains impurities which change it from a solid to a heavy, dark brown, oily liquid.

In warm weather chloracetophenone is highly persistent, but in cold weather this persistent effect is almost entirely suspended because the vapor pressure is so low that an effective concentration of vapor is not produced by evaporation. A test of the persistency of brombenzylcyanide demonstrated that when spread upon ordinary earth free from vegetation it lasted for thirty days in sufficient strength to cause irritation of the eyes, and actual lachrymation within eight inches of the

surface. This test was made out of doors on ground exposed to the weather.

The temporary blindness caused by these lachrymators disappears on removal to a pure atmosphere. In aggravated cases washing the eyes with a saturated solution of boric acid is beneficial. Rubbing the eyes is injurious, and there is no need for bandaging.

THE VESICANTS.—Mustard gas and Lewisite. Mustard gas, β,β'-dichlordiethylsulfide, is not only a highly vesicant material but also a powerful pulmonary irritant. Unlike chlorine and phosgene it does not cause acute pulmonary oedema but attacks the whole respiratory system, producing inflammation of the trachea and bronchi, with necrosis of the mucous membrane and development of secondary bronchitis and broncho-pneumonia. Mustard gas is one of the most persistent of the chemical warfare agents as well as one of the most toxic.

Lewisite, β-chlorvinyldichlorarsine, is also a powerful respiratory irritant, and although more toxic than mustard gas is less persistent. Mustard has an odor of garlic, while Lewisite resembles geraniums in odor. The symptoms produced by both are the same: vomiting, burning of the eyes followed by inflammation, a hoarse cough, expectoration, severe pain over the chest, and burning of exposed skin surface of moist areas, followed by blistering. First aid treatment should include early bathing to wash off the mixture. The eyes, nose, and throat should be well cleaned with a 2 per cent alkaline sodium bicarbonate solution. In case of skin splashes the skin should be washed continuously with running water. If possible, carbon tetrachloride saturated with chlorine or strong alkaline sodium hypochlorite should be applied. As soon as possible the affected part should be washed with an organic solvent such as benzine, chloroform, or ether.

TOXIC SMOKES.—The standard chemical agents adopted by the Chemical Warfare Service up to the present time are diphenylchlorarsine and diphenylaminechlorarsine. These resemble each other very closely. Diphenylchlorarsine is more commonly known as DA and diphenylaminechlorarsine is usually called DM. The toxic effect is produced not by the vapor given off by these materials but by the finely divided solid particles of the materials themselves. The only means of protection is mechanical filtration.

Both toxic smokes are powerful irritants to the nose and throat. Nausea, vomiting, and general prostration, together with violent sneezing and coughing, follow soon after breathing. Headaches may be intense and last for several hours. An unprotected man may be sick

for ten or twelve hours or more, but these smokes seldom, if ever, kill in the concentrations met in the field. Chlorine gas is effective in the treatment of casualties. Washing the exposed body surfaces with water, and application after they have been dried with an alkaline bicarbonate 20 per cent hypochlorite solution will likewise reduce the rash.

SCREENING SMOKES.—The chemicals employed for this purpose are titanium tetrachloride, zinc chloride, hexachlorethane (HC), oleum, phosphorus, and sulfur trioxide. These form solid or liquid particles. Even when the material itself is absolutely inert and harmless the particles tend to irritate the lungs when breathed in suitable concentration. All such smokes when breathed deposit a considerable percentage of the smoke materials on the lungs and breathing passages, and such material is bound to cause irritation and discomfort.

Sulfur trioxide and oleum smoke are probably the most irritating. Next in order are the rather strongly acid smokes such as titanium tetrachloride. Zinc chloride smokes become quite irritating when the density of the smoke is high. If hexachlorethane is not decomposed but distilled off by the HC candles, it will produce nausea if the concentration of the smoke is very great. Phosphorus smokes probably give the least discomfort and irritation. Unprotected troops may safely operate for more than fifteen minutes, however, in heavy concentrations of a smoke produced by titanium tetrachloride or by the hexachlorethane smoke candles.

Effectiveness and Relative Humaneness

Chemicals constitute a very effective weapon. Of the total number of casualties in the American army during the World War, 27 per cent were due to gas. This number was almost twice as great as that due to shrapnel and almost four times as large as that caused by shells. Tactically chemicals have many advantages. To deny territory to the enemy all that is necessary is to mustardize the area. Gas is a good harassing agent. It forces the enemy to keep his mask on. The wearing of the mask reduces the soldiers' efficiency by at least 25 per cent. Chemical agents have proved important for deception and concealment. Smoke has value as a screen for troop movements, as a camouflage for artillery positions, as a decoy to draw enemy fire, and as a bar to enemy aerial observations.

The charge most frequently leveled against war chemicals is their cruelty. History teaches that this is not the criterion by which a weapon's employment is determined. Effectiveness is the standard.

Nevertheless, even this charge is unfounded. In "A Comparative Study of World War Casualties from Gas and Other Weapons," Major General H. L. Gilchrist measures the humaneness of any form of warfare by comparing the degree of suffering at the time of injury, the permanent after-effects, and the percentage of deaths to the total number injured. He found that gas caused less suffering than wounds by other weapons.

During the past war there were 70,752 casualties from gas in our army. Of this number 200 died on the field of battle and 1221 died in the hospitals from the effects of gas exposure. The mortality rate was thus 2 per cent. There were 187,586 casualties from weapons other than gas. Of this number 46,519, or 24 per cent, died. The experience of the British was similar.

There were 812 men blinded in one or both eyes from war weapons during the war. Of this number gas was responsible for 33, or 4 per cent, other weapons being responsible for 779 or 96 per cent.

War weapons other than gas were responsible for 9939 permanently crippled soldiers. Gas was responsible for 33 permanently crippled.

In the year 1918 there were one and one-half times as many cases of tuberculosis among all American troops in France as there were among those gassed, and in 1919 there were more than one and three-quarters as many tuberculosis cases among all troops as there were among gassed troops. This means that if gassing was not an actual deterrent to tuberculosis, the small percentage of tubercular cases among the gassed can only be accounted for by the care these patients received in the hospitals.

From an exhaustive study of this entire subject, during which every effort was made to ascertain the true facts concerning the immediate and remote effects of the different warfare gases, the amount of suffering produced by each at the time of exposure, and the percentage of deaths occurring among gas wounded as compared with the percentage of deaths resulting from other wounds, no other conclusion can be drawn but that chemicals in warfare are the most humane of the recognized weapons.

Limitations of Chemical Warfare

It is when they describe the potentialities of chemical warfare that writers for newspapers and popular magazines allow their imaginations to hold full sway. With a few strokes of the pen they wipe out the entire population of large cities. They paralyze nerve centers. They envisage the personnel on ships as completely destroyed by unknown

poison gases liberated in every possible way and sucked into the whole ship by the ventilating system. Battleships, scout cruisers, airplane-carriers, and submarines are pictured with gassed crews idly and uselessly floating on the waves. Always the destroying chemical is unknown, and thus these writers are relieved of the necessity of determining the quantity of chemical required to produce toxic concentration over the area, a calculation which would soon convince them of the impracticability of the operations. No chemical has yet been developed which makes them feasible.

The scientific point of view considers the possibility of fresh substances being discovered with new or vastly increased toxic properties, as well as their employment in so much more effective a manner as to alter the complexion of chemical warfare and to upset completely the balance between offensive and defensive power. Of the enormous number of compounds synthesized by chemists, comparatively few have properties which make them of use in war, and the most effective of each type do not differ greatly as regards the concentrations at which they become dangerous.

All the chemicals now proposed for military use with the exception of Lewisite were known long before the World War. The properties of Lewisite are not much different from those of mustard gas. Senator Paterno of Rome University in the report of the Temporary Mixed Commission for the Reduction of Armaments has a sound basis for the statement that science is unlikely to discover new substances of much greater military value than those we know today. The alarmists should look to the facts.

The Bureau of Home Economics

By Ruth O'Brien

Chemistry in one of the newer government bureaus. Direct help in raising the standard of living. The work on food and textiles.

IT may be a bit startling to some readers to know that the department of chemistry at the very masculine Massachusetts Institute of Technology is the father of home economics; but that is the case. Although home economics now deals with many sciences and arts as they apply to home life, it had its beginning in the application of chemistry to household matters. The outstanding figure in its early history, and the woman whom home economists consider the founder of their subject, was Mrs. Ellen H. Richards, a chemist. As Miss Swallow, she was the first woman admitted to Tech or, in fact, to any other strictly scientific school in this country. A Vassar graduate, she entered in 1871 as a special student in chemistry; and home economics has its roots in this broadening of her interests and activities. First a student and student assistant, she later became a member of the staff in sanitary chemistry; and, as long as it existed, she was an instructor in the Woman's Laboratory, that unique contribution which the Institute, largely through her vision and tireless efforts, made to the development of higher education for women. From Mrs. Richard's writings and many outside contacts grew courses of study and schools of home economics, as well as the present organized activities of home economists.

Home economics from the beginning has focused attention on the practical application of the sciences and the arts to everyday life and on the need for research bearing directly on problems fundamental

to satisfactory living. During the "conservation" days of war time, when an urgent need arose for all kinds of basic information in regard to food and clothing, the soundness of this viewpoint was forcibly demonstrated. Both in feeding the armies and in apportioning adequate diets to the civilian population, scientific information on nutrition and diet was found to be essential. As a result, there is today a widespread interest in adding to our knowledge in these fields and in interpreting the results so that they can be used by the public.

The Bureau of Home Economics was established in 1923 as a result of this interest and is in part a continuation of the work on human nutrition and food utilization started in the Department of Agriculture in the days of W. O. Atwater's investigations back in the 80's and 90's. It has two overlapping functions. One is to carry on research and publish information dealing with practical home problems, some of which may seem simple in themselves but which are vitally important in maintaining health and the comforts and satisfactions of home living. The Bureau is also empowered to study the relative utility and economy of agricultural commodities produced in this country for food, clothing, and household uses. This latter function came about through a rather belated recognition that efficient production avails very little if consumption is inefficient. The past few years have added emphasis to this fact and have turned attention to the evaluation of production research in terms of usefulness of the product to the consumer.

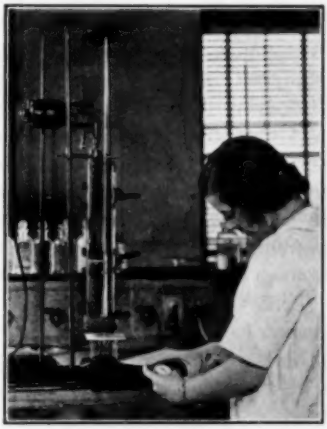
The Bureau of Home Economics is therefore the part of the Department of Agriculture primarily concerned with research relating to the utilization of agricultural products in the home; and much of its work is on cooperative projects with those other bureaus of the Department in which the various aspects of production are being studied. In addition, it bears the same relation to the extension and resident work in home economics in the state agricultural colleges as the other bureaus of the Department bear to respective departments in these institutions; and it is looked to as a source of instruction material by state extension agencies and by those engaged in the teaching of home economics. The Bureau must therefore concern itself with many aspects of the home; but only a portion of the food and textile research is appropriately discussed here as pertaining to chemistry.

Textile Investigations

A textile chemistry laboratory is maintained chiefly in connection with research on cotton and wool utilization. The chemical and physi-

cal deterioration of these fibers under actual wear and laundering is being investigated as part of the Department's work on textile production.

The Bureau, in cooperation with the Bureau of Agricultural Economics, has started a series of investigations in which cotton of known origin, graded under the government grading system and manufactured into experimental fabrics, is subjected to wear, laundering, and laboratory tests. Similar work is being done on wool in cooperation with the Bureau of Animal Industry. Fabrics with different percentages of new and reworked wool of known production history, made under controlled conditions, are tested by laboratory methods and actual service. This is the first textile research of this kind on record in this country. The primary object is to develop facilities and methods which will make it possible to evaluate, from the standpoint of use, every variety of fiber upon which production research is being carried on.



FLUIDITY METHOD FOR COTTON DETERIORATION

Since methods of laundering determine to a great extent the life of cotton materials, the effect of the different pressures and temperatures used in ironing and the different temperatures and washing aids used in laundering are studied. A modified spectrophotometric method has been developed to determine the amount of scorch produced on various types of cottons by different ironing procedures. Chemical changes are measured by the viscosity of cuprammonium solutions of the cotton, alkali solubility, silver numbers, and macro and micro copper numbers. Reports on methods of testing textile materials, and artificial soiling procedures for laundering studies have been published.

On account of the importance of fabric finishes in the utilization of cotton materials, the Bureau studies sizings for these materials. The relative value of the common starches and other sizing ingredients for mill and laundry finishing is investigated, as well as the possibility of using starches from some of the less well-known plants.

For example, the properties of starch obtained from the dasheen,

a variety of taro, have been studied. This plant can be raised in considerable quantities in the South, but few uses for it have been discovered. Dasheen starch, it was found, has greater stiffening power than the more common starches and imparts a very desirable soft feel to fabrics. Especial attention has also been given to the properties of rice starch, since there is no rice starch industry in this country at the present time, although over a million pounds were imported and 1250 million pounds of rice grown here in 1931–32. This seems to offer an additional outlet for this commodity.

Methods of evaluating fabric finishes are still empirical. The Bureau is therefore considering all of the properties inherent in the "feel" or "handle" of cloth, defining them, and developing instruments for measuring them. An instrument for measuring stiffness was invented and patented, giving for the first time quantitative measures for the stiffness produced in fabrics by various starches with and without other reagents in the sizing mixture. Technical bulletins and articles in scientific and trade periodicals report this work, while the more popular aspects as applied to home laundering are made available to homemakers through popular bulletins.

This work on sizing opens up important fundamental questions in regard to the effect of viscosity of pastes, size of starch granules, and other properties, on the coating and penetrating powers of the pastes. These problems have been attacked by means of photomicrographic work.

Food Composition

The Department of Agriculture has come to be relied upon as the principal source of authentic information on food composition. Atwater was the first to assemble and publish the available data on this subject in the well-known Bulletin 28, "Chemical Composition of American Food Materials," issued in 1906. This is a standard reference for dietitians, food chemists, and others needing figures on the protein, fat, total carbohydrates, water, ash, and calories in foods; and it is the source of most of the data quoted in text and reference books during the past forty years.

One of the important activities of the Bureau is collecting and evaluating all available material to keep these figures up to date and representative of the foods in current use. In addition to the constituents reported in the older work, the new publications give data on total sugars and total acidity in the fruits, and on starch and total sugars in the vegetables. These figures, together with the data on crude

fiber, throw light on the character of the various constituents of the "total carbohydrates by difference." These more detailed data remove one of the chief limitations of the earlier tables.

The new work has taken the form of a series of publications, each covering a particular class of foods. Circulars have been published giving figures on the wholesale cuts of beef, and on the composition of fresh fruits and fruit juices and fresh vegetables. The latter is a compilation of the proximate composition of 121 classes and varieties of fresh vegetables as contrasted with 38 given in the early bulletin. This reflects the increase in the variety of these foods now used in the American dietary. Broccoli, globe artichokes, Chinese cabbage, and dasheens were almost unknown on the American table a decade ago, but now must be accounted for by dietitians responsible for the food of either sick or well people.

The resources of the Department and the state experiment stations are available to the Bureau in collecting data for these compilations and in making needed analyses. Specialists in the Bureau of Animal Industry are consulted in connection with the analysis of data on meat composition. The work on vegetables and fruits involved the assistance of botanists, plant physiologists, and horticulturists from the Bureau of Plant Industry.

The prominence given in recent years to vegetables and fruits in American diets is undoubtedly due in part to our newer knowledge of their food value in minerals and vitamins. Vegetables and fruit have long been recognized as contributing notably to the iron content of the diet without increasing the protein or fuel value at the same time. However, few systematic studies of their iron content had been made. Recently, in cooperation with Columbia University, the analysis of 237 specimens of 83 different forms has been made by the Bureau, which has also made a compilation of the data from the literature which appear trustworthy and representative. These data, published in circular form, are of great importance in estimating the nutritive value of dietaries.

Vitamin Studies

The Bureau maintains laboratories for research on the vitamin content of foodstuffs. These studies involve investigations of the influence of the different vitamins and the development of methods for their determination. In the case of two of these factors it was necessary to work out methods for their separation in order to get a potent concentrate of one that was uncontaminated with significant amounts

of the other. The methods developed are tested out in assays on foods not already investigated, and new data on vitamin values are thus obtained. Some of the foods studied in this connection are lettuce, watermelon, figs, olives, grapes, wheat germ, and rice polish.

Portions of the work are cooperative with other bureaus of the Department. At the request of the Bureau of Entomology, the vitamin content of honey was investigated. Although no indications of the presence of vitamins A, B, C, or D were found, it was considered worth while to have established this fact. A project now under way in cooperation with the Bureau of Animal Industry deals with the value of viosterol and cod-liver oil in the diet of the hen for vitamin D storage in egg yolk. In cooperation with the Bureau of Plant Industry studies are being made in connection with the development of a white potato containing vitamin A. Many times products are exploited for their vitamin content when it seems unlikely that they contain any important amounts of the factors they are given credit for. At the request of the Food and Drug Administration, two cod-liver oil concentrates were tested for vitamins A and D and found not to come up to the claims made for them. Tea which was being widely advertised as a source of vitamin C was found to be entirely devoid of this factor.

MEASURING THE STIFFNESS OF COTTON FABRICS. INSTRUMENT INVENTED IN U. S. BUREAU OF HOME ECONOMICS

Effect of Cooking Studied

The effect of cooking and storage on vitamin content is also investigated. This is a most important part of the work, since most foods are subjected to some form of preparation before they are served, and many of the methods used are destructive of the vitamins. Broccoli was found to have lost 50 per cent of its vitamin B and a large proportion of its vitamin G when cooked in a highly approved way.

In addition to experimental work, much time is devoted to the collection and dissemination of vitamin information made available from other laboratories. In cooperation with the Office of Experiment Stations extensive tables on vitamin content of foods have been published.

The Bureau not only publishes technical reports on food composition

but also attempts to present such data in usable form for those who do not have the time for all the detailed calculations necessary in determining the adequacy of a diet. A recent publication for the use of nursery school directors who must plan the noon meal each day for pre-school children gives recipes for appropriate dishes, together with calculations of the food essentials in typical servings for children. The intake of each child can thus be easily determined. The dearth of data on the composition of cooked foods makes this a particularly helpful contribution.

Dietary Studies

An even more popular presentation of food composition data is supplied less well-trained persons by embodying the information in menus and weekly food allowances for individuals and family groups in the familiar terms of meat, fruit, vegetables, and milk. Special emergency information has been broadly distributed in cooperation with relief agencies under such titles as "Buy Health Protection with Your Food Money," "Adequate Diets for Families with Limited Incomes," and "The Family's Food at Low Cost." A weekly release for newspapers gives practical suggestions on food selection and current food prices. Such material has been invaluable during recent years to homemakers who have been compelled to maintain the health of their families on low-cost diets and to officials charged with the responsibility of disbursing relief funds.

DETERMINING THE EFFECT OF VITAMINS

The Bureau has made a number of studies of the food consumption of farm families in connection with investigations on standards of living. The average quantity and money value of the food supply were found and the nutritive value of the average diets calculated in terms of calories, protein, calcium, phosphorus, iron, and units of certain vitamins. These findings are compared with generally accepted nutritional standards and throw considerable light upon the influence

of food habits on the nutrition of large groups of our population. A recent study of the food supply of farm families in a region where pellagra is prevalent has correlated the incidence of the disease with deficiencies in the diet, and has demonstrated the effectiveness of certain practical and inexpensive measures in reducing the incidence and severity of the disease.

A study of the trends in food consumption and the food purchasing habits of housewives at different economic levels reveals the extent to which knowledge is being put into practice, and is of help to the educator in formulating his program of instruction, and to the producer in adapting output to consumer-demand. Studies are also in progress of the food eaten by healthy, growing children. Interpreted in terms of articles of food and their chemical composition, these data contribute to the establishment of food standards for the optimum development of children.

Food Utilization

Studies on food preparation connect directly with the Department's experimental work on production. As part of a nation-wide cooperative project on the influence of various production factors on the palatability of meats, the Bureau each year cooks hundreds of cuts from experimental animals for testing and final judging as to eating quality. Animals are being produced at some twenty-five state experiment stations under controlled conditions of breeding and feeding. Standard methods of cooking and judging the cooked product have been worked out.

This project also affords a unique opportunity to collect data on the cooking of meats applicable to the home and the institutional kitchen. The comparative effects of slow and rapid roasting and the relation of temperature to the tenderness, flavor, and shrinkage of roasted meats are some of the points covered. Information on the character and the amount of cooking loss to be expected from different kinds and cuts is necessary for estimating the food value of cooked meats as well as the number of servings in a roast of given weight. The amount of shrinkage which can be reasonably expected when a piece of meat of a certain market grade is cooked in a definite way is of considerable financial importance to restaurant and hotel managers, and the dietitian must have this kind of information in calculating the protein in a patient's diet.

Quality tests on vegetable foods are carried on in cooperation with the Bureau of Plant Industry. Such work is of direct value to both

producer and consumer. For example, the influence of different fertilizer ratios and different storage conditions upon the cooking qualities of important varieties of potatoes is determined. Storage conditions influence the form of carbohydrate in the potatoes when they are put on the market, and this in turn affects the cooking qualities. A practical result discovered is that potatoes stored at a temperature of 40° F. and below brown too rapidly when fried, so that it is impossible to make good potato chips from them. This fact is very significant to manufacturers of this product as well as to farmers producing potatoes for that market.

Cooperative studies are made of the cooking qualities of different varieties of native and imported rice. The great range in the time required for cooking these has led to the effort now being made to prevent mixing of varieties in the marketing of rice. It has also been found that certain varieties should not be shipped to countries of high altitude, because they cannot be cooked satisfactorily there. Some others are especially adapted to the processing methods used in the commercial preparation of canned soups. On account of a tariff question involved, the Bureau studied the differences between the characteristics of the California lima bean and the imported lima bean. Native grown lentils were compared with imported lentils, to the advantage of the former, since they cook more quickly and have a less strong flavor than the imported.

Organization and Personnel

At present the Bureau is administered in four divisions, Food and Nutrition, Textiles and Clothing, Economics, and Information. The staff consists of thirty-six professional women with a small corps of laboratory assistants, stenographers, and clerical workers. The professional personnel is to a large extent representative of the professionally trained women now working in this country. In addition to home economists, it includes a few textile chemists, textile physicists, food chemists, nutritionists, food economists, and bacteriologists, all working in sciences in which training has been available for women during only a comparatively recent period. The Bureau is apparently the only organization of its kind in the world and offers very far-reaching and interesting opportunities for demonstrating the value of research on utilization problems.

Dental Chemistry

By R. B. Savin

Chemists study dental problems, from alloys for fillings to the cause of tooth cavities.

COMMENCING with the earliest dentistry of which we have any reliable knowledge and following its progress until now, the phases that have marked its advancement might be classified as Destructive Dentistry, Reparative Dentistry, Restorative Dentistry, and Preventive Dentistry. The earliest dentistry, which also prevails to a lamentable extent throughout the world today, consisted in extracting offending teeth without regard for subsequent appearance, functional degeneration, alteration of anatomic relationships in the mouth, or for the effect upon health through the loss of the masticating organization. It may well be termed destructive dentistry.

Reparative dentistry, the filling of tooth cavities with a variety of materials including gold, had its beginning in early history, but made little headway until within the past century. Restorative dentistry includes the replacement of lost human teeth by substitutes of wood, ivory, bone, metal, and in recent times, porcelain. The realignment of teeth, and the restoration of occlusion (generally entitled orthodontia), was known to the ancients, who ligated the teeth with gold wire or other ligatures. In a sense this was restorative dentistry.

As in medical practice, the ideal treatment of the mouth and teeth in our modern conception is in the prevention of destructive diseases. The teeth and gums are safeguarded by corrective measures locally applied and by the establishment of general bodily health.

Now, where does chemistry play a part in the development of dentistry and in dentistry as we know it today?

Bio-chemistry, pathological chemistry, inorganic and organic chemistry, analytical and synthetic chemistry—any chemistry that applies to medicine—all these also apply in some degree to dentistry, for the two sciences are working together to the same end, the improvement of mankind in every aspect. To discuss dental chemistry in a comprehensive manner is manifestly impossible in a brief paper.

LET us inquire into a few of the dental operations in which chemistry is playing a part. An ordinary filling in a human tooth may be of

gold, gold and platinum alloy, gold and palladium alloy, silver-tin-mercury alloy, or copper-mercury alloy. It may be of precious metal cast to form and cemented in place, it may be of gold foil malleted to place, it may be of porcelain or of "silicate" cement, or it may be a temporary filling of oxyphosphate of zinc cement. It can also be of gutta-percha.

Needless to say, the employment of these materials in every case commenced in an experimental way. A suggested use was followed by trial, with only empirical methods and formulas for the preparation and insertion of the materials.

The dental cement, the casting gold, the alloy wire or plate, and the silver alloy for amalgam are the products of manufacturing laboratories supervised by chemical engineers and metallurgists of the highest qualifications. Oxide of zinc and a solution of zinc chloride were known to produce a cement in 1843, when a French architect, Sorel, devised a zinc plaster for setting tiles. This cement was suggested for use in dentistry and was used with considerable success for a long while. In 1832 lime and phosphoric acid produced a plastic mass which was the suggestion for the oxyphosphate cements which later employed zinc oxide as the body.

The real study of these zinc cements remained for the chemists of the past quarter century. Too rapid setting, excessive heat of reaction, porosity, insufficient strength, attack by mouth secretions, and short life, were faults which gave way before the systematic investigation of the chemist. The best zinc cements today exhibit what may be called perfection in physical and chemical properties.

Copper salts, silver nitrate, silver chloride, and mercurammonium chloride are employed in dental cements for their antiseptic and germicidal value. Copper salts and silver salts both discolor the cement, precluding their use in anterior locations in the mouth. Copper salts discolor by chemical action, silver salts by actinic exposure. A chemist suggested the use of $HgNH_2Cl$ (mercurammonium chloride). A cement containing this germicide is very popular today because of the high potency of the antiseptic and because it is nondiscoloring in the mouth.

Dental cements are daily used materials of exceedingly high importance to modern dentistry; and the profession and the public can thank the chemists for their perfection.

Silicate filling materials are cements in which aluminum silicate is used. They are translucent and of subtle colorings, to match human teeth. To produce these cements and maintain uniformity in them, to have them behave properly in applications of paper thickness, requires precise methods of production that only modern chemistry can control.

GEORGE WASHINGTON wore sets of teeth made of ivory, wood, and bone. They were assembled on wood arches, wired, pivoted, hinged, and prepared by Dr. John Greenwood. Today the poorest laborer can have an artificial denture of porcelain teeth on a plate of vulcanized rubber, celluloid, or synthetic resin. The porcelain teeth are made of feldspar, silex, and kaolin, with metallic oxide coloring; and they are formed in bronze molds and fired or glazed in high temperature gas, oil, or electric furnaces. Chemistry is everywhere present in the production of these modern artificial dentures—in the porcelain, in the rubber base, in the resin and celluloid base—even in the oil and gas that heats the furnace.

A material of suitable properties for the base of an artificial denture must exhibit strength, resilience, density, susceptibility to high polish, and durability in the presence of the mouth secretions, fruit juices, condiments, and other liquids commonly taken into the mouth. Hard rubber exhibits these qualities to a very satisfactory degree. Cellulose compounds satisfy some of the requirements. Both materials are in wide use, with rubber still leading in the total volume employed. The recent developments in denture bases include the phenol resins and resins of other origin, one of which is soon to be given to dentistry as a perfected material. Needless to say the celluloids and the resin derivatives are strictly the product of modern chemistry.

When Goodyear obtained his patent for hard rubber (vulcanite) in 1851, the fact that sulphur and caoutchouc combined in the presence of heat was all that was known of the phenomenon—except perhaps that a sulphurous odor accompanied the reaction. In subsequent years, after dentistry had adopted vulcanite as a base for dentures, the chemistry of this combination was studied. Today the manufacturer of dental rubber knows to a certainty what happens to the latex and to the sulphur in effecting the combination, and his chemist gives him the information.

NITROUS oxide was first used as an anesthetic in 1844 by Horace Wells, a dentist. The gas was liquefied in 1877, and thereafter could be transported in cylinders. In the past twenty-five years it has been used in combination with oxygen for minor and major surgery—and the chemists have not only perfected the production, the purification, and the dehydration of the gases, but they have also shown exactly how these anesthetics react in the human blood stream. The known reactions of N_2O and O_2 led the way to the use of other gases and the combinations of them now commonly employed for anesthesia.

Dental materials include calcined gypsum products, clays, refractory

earths, investments for gold casting and soldering, waxes and resinous compounds, precious metals and alloys in numerous forms, solvents, acids, medicaments, low fusing base metal alloys, and abrasive and polishing compounds. Many of these must possess definite chemical and physical properties.

Porcelains, refractories, waxes, varnishes and lacquers, and abrasives are specified with reference to their physical properties rather than with reference to their chemical characteristics. Today's dentistry demands definite knowledge of thermal expansion and contraction, densities, hardness, tensile and compressive strength, and other physical properties of many materials.

It is not enough to know that a certain investment material sets and hardens in an approximate length of time. Its expansion or contraction at different periods must be known to a fraction of one per cent. A silver-tin-mercury amalgam must qualify to standards set up by the U. S. Bureau of Standards in conjunction with the Research Committee of the American Dental Association. Specifications for gold alloys have been similarly set up, and standardization along scientific lines is the goal of the leaders in dental progress.

Steel instruments for dentistry are better today as a result of the knowledge of steel chemistry; and although all manufacturers are not equipped to make analyses in their own establishments, they use the available resources for chemical control.

DENTAL caries, the chief cause of the destruction of teeth, awaits definite chemical knowledge before it can be eliminated. In all the dental centers of the world chemists are studying this disease of the teeth. Until a few years ago the condition was regarded as local in its inception. Later it was thought to be systemic, and it has also been regarded as of bacterial origin, but no positive indictment has yet been made against a single organism. Caries have been charged against a deficiency in calcium metabolism, against hyperacidity—but the true cause is yet to be shown, by the chemist if not by the bacteriologist.

Faulty dentition, abnormalities in tooth alignment, "soft" or "chalky" teeth, imperfect enamel on the tooth crown, all have their origin in faulty chemical processes, lack of control by the endocrines. These are problems of the chemist, the biologist, the bacteriologist—but without the chemist there would be no hope of solution.

Chemistry at Vassar

By Mary Landon Sague

Early provision for the study of chemistry at a leading college for women. The department at Vassar today.

VASSAR College, founded by Matthew Vassar in 1861, was ready to receive students in the fall of 1865. In the first catalogue we read, "The object of this college, as stated by its founder, is to accomplish for young women what colleges of the first class accomplish for young men; that is, to furnish them the means of a thorough, well-proportioned, and liberal education, adapted to their wants in life."[1] It was recognized from the beginning that to accomplish such a purpose must necessarily involve a departure from the existing curricula. At the same time the guidance to be furnished by such curricula was not to be overlooked.

It is obvious that such a program must have included generous provision for the sciences. In his address at the celebration of the fiftieth anniversary of the opening of the college President *Emeritus* Taylor[2] gave "as evidence of the outlook and advanced stand" of the first board of trustees the fact that "when the first building, Main, was erected (1861–65) provision was made for a students' laboratory (then very uncommon in America)." He further stated that at its beginning the college was equipped with "laboratories for the sciences such as few colleges could boast." In the description of the equipment given in

[1] Vassar College Catalogue, 1865–66, p. 16.

[2] Taylor, James Monroe: "Vassar's Contribution to Educational Theory and Practice." The Fiftieth Anniversary of the Opening of Vassar College—A Record. P. 24. Vassar College, 1916.

the first catalogue we read, "The philosophical and chemical apparatus are of the most approved construction and complete for all purposes of illustration in the departments to which they belong."[3]

It is not surprising that a department of mathematics, natural philosophy, and chemistry was among the first established at Vassar. Chemistry was part of the regular course for one semester and might be followed by a second semester of special studies in the applications of chemistry. This department was in the able hands of Professor Charles S. Farrar, who was assisted by Miss Emma Sayles, teacher of chemistry, mathematics, and the English language, and by Miss Barbara Grant, teacher of mathematics and chemistry. In the words of one of his early students, Professor Farrar was "a man of a wonderful magnetism, a subtle intellect, and a power of presentation that made students hang breathless on his prayers or his lectures. It would be impossible to overestimate the enthusiasm his presence and his teaching, both secular and religious, awakened. Girls went to his Sunday lectures provided with note-books, and there was no thinker or essayist with whom their studies made them familiar whom they could for one moment consider superior to Professor Farrar."[4] It is not strange that his courses were popular and that the announcement of special experiments should crowd the lecture room with faculty and students alike.

THE catalogue of 1866–67 gives the proposed course of study, in which chemistry appears as a senior course. That it was elective is indicated by the statement that no student was expected to pursue all the courses listed but that "a certain liberty of choice is allowed to each, under the strict supervision of the President and Faculty—none will be allowed to neglect any branch of literature, science, or philosophy that is deemed essential to a sound general education."[5]

Even this balanced plan met with bitter criticism in an article published in April, 1870,[6] in which the writer claimed, among other things, that too much time was spent on Greek and astronomy and too little on chemistry. In his reply President Raymond[7] regretted that the writer took his information from the catalogue of 1867, thus basing

[3] Vassar College Catalogue, 1865–66, p. 19.

[4] Norris, Mary Herriott: "The Golden Age of Vassar," p. 44. Vassar College, 1915.

[5] Vassar College Catalogue, 1866–67, p. 28.

[6] "The Two Educations." *Godey's Lady's Book*, **80**, 22, 1870.

[7] Raymond, John Howard: "The Vassar Course of Study." *Godey's Lady's Book*, **81**, 40–43, 1870.

his criticism "on so much that belongs wholly to the past." The curriculum was changing rapidly in these formative years, and by 1870, students who elected chemistry as a regular study devoted one-third of every day to it during the first semester of the senior year. They might continue it during the entire year, and those who were special students could spend an unlimited amount of time on their work in chemistry.

The most approved texts and methods of teaching were used, the conduct of the work was revised in keeping with the progress in science, and with the developments in the college curriculum and as students were better and better prepared for their work, the scope of it was extended. In May of 1873, President Raymond,[8] in response to a request from the United States Commissioner of Education, prepared a report on the college in which he gave a full outline of the work in chemistry and of the equipment for it. Chemistry was given for two semesters, in the first of which the class met five times a week for the study of the theory of inorganic chemistry and the practice of qualitative analysis, while in the second semester it met three times a week for the study of organic chemistry and certain applications to the arts. In the latter were included the study of the precious metals, electro-plating and electro-casting, photography and photochemistry, the metallurgy of iron and the manufacture of steel, the chemistry of bread-making, general culinary chemistry, toxicology and antidotes, dyeing and printing, coal tar and its products, the curing, tanning, and dressing of leather.

THE work was carried on in three rooms in the main building: the professor's laboratory in the middle room, with the lecture room on one side and the students' laboratory on the other side. All the rooms were provided with hot and cold water, gas and steam, and sinks, basins, and wall tables. The majority of the experiments were done by the students themselves, the class being divided for laboratory practice into small sections of eight to ten students, each section meeting two or three times a week under the supervision of an instructor. In the students' laboratory each table, assigned to the use of one student, was equipped with the reagents and apparatus necessary for qualitative analysis. In addition there were cabinets containing a considerable amount of material illustrative of the work of the second semester. This account gives evidence of a splendid development of the work in chemistry in less than ten years from the opening of the college.

[8] Raymond, John Howard: "Vassar College—A Sketch of Its Foundation, Aims and Resources, and of the Development of Its Scheme of Instruction to the Present Time." S. W. Green, New York, 1873.

In 1874 LeRoy C. Cooley came to Vassar as professor of physics and chemistry and ten years later was appointed to the newly created Matthew Vassar, Jr., Professorship of Physics and Chemistry. Under the stimulus of his enthusiasm, the exacting demands of his high standards, and his encouraging interest, work in the department prospered. Recognizing that more adequate quarters must be furnished for the growing needs, two nephews of the founder, Matthew Vassar, Jr., and John Guy Vassar, gave to the college in 1880 The Vassar Brothers Laboratory for physics and chemistry, and equipped the building in the most modern manner. With the increased facilities thus afforded it was possible to extend the work in chemistry to three semesters and to include more analytical chemistry. The training was thus made extensive enough to make possible the announcement in 1889–90 that "a certificate of study in inorganic chemistry at Vassar will be accepted in place of the corresponding course at the Woman's Medical College of the New York Infirmary."[9]

FOLLOWING the appointment in 1893 of Charles W. Moulton as associate professor of chemistry, the work of the department was expanded to what was described as a "complete course in chemistry"[10] in six parts, in which there were included, in addition to the established courses, one in the chemistry of water, air, and food and one on the history and philosophy of chemistry, the latter for seniors only. In the following year the departments were divided; Dr. Moulton became professor of chemistry while Dr. Cooley remained the Matthew Vassar, Jr., Professor of Physics and Chemistry.

As the college increased in size and new courses were offered, the Vassar Brothers Laboratory, in spite of additions to it, became quite inadequate. Those of us who were students in that laboratory look back with increasing appreciation and wonder at the splendid accomplishment of the members of the department who worked under the crowded, difficult conditions of those days. In 1908 Dr. Henry M. Sanders, for many years chairman of the Board of Trustees, gave to the college in memory of his wife, Eleanor Butler Sanders, the Sanders Laboratory of Chemistry, which was dedicated in 1909. The generosity of the gift was matched by the skill and far-sightedness of Professor Moulton, whose plans, worked on through the years, were incorporated in those of the architects. The building with its equipment, including many items of original design, is a lasting monument to the sound

[9] Vassar College Catalogue, 1889–90, p. 31.
[10] Vassar College Catalogue, 1893–94, p. 46.

judgment, thoroughness, and creative ability of Professor Moulton who, for thirty years, so ably directed the department, keeping it abreast of all that was best in the development of the science and of the methods of presenting it.

AS VASSAR is primarily an undergraduate college and urges its students to go elsewhere for graduate work, its function is to give a thorough undergraduate training, with opportunity in the advanced courses to do work of a graduate character. The department of chemistry offers at present courses in general chemistry, applications of chemistry, qualitative analysis, quantitative analysis, hydrogen-ion determinations, organic chemistry, chemistry of food and nutrition and food analysis, organic preparations and analysis, and physical chemistry. In addition, students may carry on independent work in the junior and senior years.

Although the introductory course serves as the first course in the major field for those who begin chemistry in college it is also taken by many students who are not science majors. In the present Vassar curriculum the group in which chemistry is placed is so large that, with the required election of only one subject from that group, it is reasonably certain that students, in electing to meet the requirement, will choose that science which bids fair to be congenial. The class is therefore likely to be quite homogeneous; and the course which is actually a prerequisite for some students forms a satisfactory general course for the others. Both the theoretical and descriptive phases of the subject are developed. Weekly quizzes as well as small supervised laboratory sections give opportunity for much individual work.

For the student who has presented chemistry as an entrance unit there is a course which gives first a brief review of the principles of elementary chemistry. Any student who presents satisfactory evidence that this review is not needed for any portion of the work is given special supplementary reading assignments. By this review the class is prepared for the work in qualitative analysis, which is completed by the end of the year, placing such students one semester ahead of those who begin chemistry in college.

For students who wish to major in chemistry the course varies in the second year. Those who have begun chemistry in college take qualitative analysis in the first semester and quantitative analysis in the second semester, while those who have entered with chemistry must take quantitative analysis and usually do take hydrogen-ion determinations. In the third year the classes join in organic chemistry. In the fourth

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year the group is again divided, some students electing one or both of the courses in physical chemistry, others those in food, while a few elect courses in both fields. Such is the main outline of a common sequence in chemistry which must, of course, be varied to suit the needs of the individual student, the actual plan being made after a conference with the departmental consultant.

THE general college requirement is a minimum of 45 hours in a major field, which must include at least 12 hours of advanced work, 6 of which must be taken in the senior year, and must also include some work not in the major department. For a chemistry major correlative courses are required in some laboratory science allied to the student's main interest in chemistry. For physical chemistry, mathematics through calculus is required. (This rule concerning electives naturally operates to bring into certain of the chemistry courses some students majoring in other fields of science who do not follow the sequence for a major in chemistry.) In the department of chemistry a special requirement is made of a reading knowledge of French and German, which are not counted in the hours for the major field.

Each year some six or eight of the students majoring in chemistry are employed as student assistants, thereby receiving valuable training not to be secured in the regular courses. They make up solutions and do any other work necessary in getting the laboratories ready for use, working at first under supervision and later taking charge of a group.

Many students begin this work in the second semester of the freshman year and become, by the time they are seniors, exceedingly valuable and dependable assistants.

In recent years our chemistry majors have entered the teaching profession less than formerly. In each class there are some who go into graduate work directly, some pre-medical students, some who secure positions in hospital laboratories, some who go into commercial work, and, finally, some who have taken the work because of interest in it and with no intention of using it professionally.

The Chemical Report

By W. C. Dumas

Ought chemists' make fuller reports? Making sure all the conditions are stated. Protection against misuse in advertising.

THE remarks made below are limited to the short chemical report or "certificate of analysis," and do not refer to more elaborate reports of studies or investigations. They are a plea to chemists and laboratories who value their reputations to be just as careful in these relatively small matters as they would be if much larger interests were involved. The report is to the chemist a declaration of truth as he finds it. He vouches for its correctness; he certifies its honesty; he is on record many times as giving a correct verdict of quality.

The very brevity of a certificate of analysis sets its own limitations. Such reports generally seek to give as briefly as possible the results of a considerable amount of work. Frequently the findings of work requiring a day or two to carry out are expressed in one line. A lawyer would write a brief of twenty-five pages about it and collect in proportion, but the chemist is expected to report in an unmodified, unqualified manner and quit. It appears, however, that most certified reports aim to be *too* brief.

Analyses are of many kinds, varying in completeness from simple qualitative tests to elaborate quantitative analyses. The forms they take may be numerous. Elementary quantitative compositions may be calculated to groups—phenols to include cresols; or fatty acids to include a mixture of several.

In making a report it would be quite proper for the chemist to express

it so as to increase the value for the purpose it was intended. But he doesn't always know the purpose.

Therefore, too much care cannot be exercised by the chemist who signs a report to make sure that he is safe-guarding himself and at the same time giving the information asked for by his client. To aid in doing this, he should see to it that information on the certificate, other than the actual results of his investigations, should be as full and complete as possible. There should be brief statements covering such points as from whom received, the date received, original condition on reaching the laboratory, and sometimes a description of the sample. Often it is advisable to also include a statement concerning the specific information asked for by the client. In certain cases it might also be well to add something about the purpose of the analysis.

SO MUCH for the notations that might be of value preceding the report of the actual findings. Someone might object that all the above is unnecessary, that for practical purposes it is excess baggage. But no chemist knows after his certified report goes out how it may be used. All these precautions are necessary to protect the chemist himself and his reputation. Instances are not rare where a material was submitted with instructions merely to make an examination for some particular constituent, or to determine some constant, and long after the report has been made the chemist may learn that it is to be used in a law suit and that he is expected to give testimony.

Perhaps the incomplete or partial examination that he was asked to make without knowing for what purpose the report was intended has very little value as evidence in court. Its very incompleteness, although the figures given are true, makes the testimony appear ridiculous. Had the chemist known the original purpose, his work might have been laid out so that data of value could have been reported. In any case he is safe-guarded if his report carries statements which show something of the history of the sample and the original purpose of the analysis.

The commercial laboratory is expected to make all kinds of analyses and reports. The tests range from the simplest to the most complex. A great deal of this is simply for the information of the client having the work done, and the result may be expressed in one line on the report. At the time he receives the report, the client understands just what it means. But if the report bears only a number, the name of the material, the results of the analysis, and nothing more, it may be meaningless after six months have elapsed, especially if it has been passed on to a second or third party. Moreover, the second or third party may undertake to

compare this result with a newer result by a different laboratory, to the detriment of the first laboratory. When an executive has reports in his files from several chemists on what is supposed to be the same subject, and these reports vary widely, discredit is cast on all the chemists concerned as well as on the profession of chemistry.

In a large number of cases, the commercial laboratory has nothing to do with the selection of the sample submitted. The chemist is bound by what his sample itself is and not by what it is supposed to represent. A possible remedy might be to have the laboratory supervise the drawing of samples or study the situation before the samples are taken, so that the chemist will be in possession of all the facts. This procedure is not always possible, especially with small concerns or with individuals who are limited as to the expense involved. Frequently the importance of the case does not warrant the expenditure of any considerable sum of money.

THERE is entirely too much misuse of chemical certificates after they have left the chemist's hands. Advertisers will take advantage if the chemist is not careful. Reports of comparative analyses of different brands of merchandise and materials have been used side by side in such a way as to make it appear that the analyst has indorsed one or the other as superior in quality or performance, whereas no indorsement whatsoever was made, and only the facts as found were reported. The certificate might therefore bear to advantage the printed note, "Not to be used for advertising unless authorized," or some such qualifying remark, as well as other comments pertinent to the particular case.

There is no sure remedy for these abuses but if the man making a report will be a little more careful such troubles will be less frequent. To sum up: Be sure to give the necessary or required information as clearly and accurately as possible; and so modify or explain any statements that their use or meaning cannot be misunderstood after the lapse of time.

Pros and Cons of Licensing Engineers[1]

The report of a joint committee of the Washington chapters of eleven engineering societies. Licensing in general. How present laws have worked.

REGISTRATION and licensing of engineers is now being given consideration by a special committee of the Institute,[2] authorized at the March meeting of the board of directors. The subject is one that has recently been or is now actively before engineering organizations in many of the states of the Union. In Washington, D. C., the Washington Society of Engineers and the local sections of ten national engineering societies, including the A.I.M.E., recently had a joint committee investigate the subject, this committee formulating a proposed law that has been presented to Washington engineers for their consideration. At the same time the committee has summarized the reasons for and against registration of engineers in Washington, D. C. As many of these reasons are of more than local application, they are here reprinted so that all members of the A.I.M.E. may be informed on the subject. It is expected that some report of the Institute's Committee on Registration, State Councils, and Professional Development will be made at some forthcoming meeting of the board of directors.

Reasons for and against Registration of Engineers in General

2.[3] The words "Professional Engineer" and the practice of "Professional Engineering" are too difficult to define to admit of embodying them into a law which will clearly and without injustice designate who comes within its jurisdiction. The problem is complicated by the fact that the building industry is practically dominated by commercial engineers.

2-A. The words "Professional Engineer" and the practice of "Professional Engineering" can be sufficiently, clearly, and justly defined for *legal* purposes. It is now being so used in more than twenty states. Commercial engineers who have not the education nor experience to qualify under this bill strongly oppose engineer registration.

[1] Reprinted from *Mining and Metallurgy*.

[2] Of Mining and Metallurgical Engineers.

[3] Sections 1, 7, 8, and 13, which apply particularly to local problems, have been omitted.

3. Registration will not be effective in protecting the public against incompetency, dishonesty, or the economic effects of having Commercial Engineers misrepresented to them as unbiased Professional Engineers. The fact that a lawyer or physician is licensed to practice is not regarded as assuring his competency or his honesty.

3-A. Laws against murder do not stop murder but they lessen its likelihood of occurrence and tend to decrease its frequency. Furthermore, such laws furnish the machinery whereby society may protect itself. The advocates of engineer registration do not contend that registration will stop incompetency or dishonesty but they do contend registration will improve conditions and make dishonesty and incompetency less likely than it is today.

4. Membership in a reputable national engineering society can be used by both the public and the profession to determine the fitness of an engineer to handle the work in question. Practically all of the large engineering societies have definite requirements for each grade of membership and the members are quite carefully and painstakingly chosen. However, in a profession with the widely dispersed ramifications of engineering, the public should be educated to investigate the technical reputation and the intellectual honesty of any professional engineer regardless of his membership or registration. This is practical in a city of medium size, whereas it may not be in a large state.

4-A. Membership in any private corporation will never be used by the public to determine professional fitness. First, because a layman does not know what the membership requirements are of even the four Founder Societies, and there are 140 engineering societies in the United States. How is the public to determine which are to be used as a standard? But most important of all—only about 40 per cent of all the men in the United States who claimed to be *earning a living* by engineering are members of the four Founder Societies in any grade of membership and less than 70 per cent are members of any kind of an engineering society. Legal registration is the only known way of controlling the practice of all members of any profession.

5. Registration is just another restriction in business affairs and also an additional occupational tax. Engineers must protect their own reputations, especially in their own limited fields of activity, and not lean upon a registration board to certify the registrants to practice in all branches of engineering.

5-A. If society were a simple organization with only one engineer and a few hundred people, all of whom knew each other personally, registration could readily be dispensed with, but society today in the

United States is made up of more than 120,000,000 people and almost 200,000 of them claim to be earning their living by the practice of engineering. Registration is a restriction but it will work no hardship on a competent, honest engineer, and there is no other way of controlling engineering practice in the complex society in existence today.

6. Registration laws are claimed to be unconstitutional. The Pennsylvania Registration Law was declared unconstitutional and the present Pennsylvania Registration Law was repealed by the Legislature but the repeal measure was vetoed. The present Pennsylvania Registration Law has not been tested.

6-A. Registration laws for various professions have been upheld by the courts as constitutional. It is conceded in some states, as this matter has evolved, that some of the laws would be too drastic and would be justly declared unconstitutional. But engineer registration laws are no longer new. No state which has ever had engineer registration has completely abandoned it. Naturally there are continuous efforts made to amend and improve the laws.

How the Law Has Worked

9. It is doubtful whether the law has been helpful to those states which already have it. Some engineers in states having registration laws report the law as useless.

9-A. In many states the law is reported as satisfactory. In Colorado, for example, Colorado Society of Engineers (membership 395 in 1929) and Colorado Engineering Council have endorsed registration of engineers and are pleased with the Colorado law. Furthermore, the proceeds from the Colorado Engineer Registration Law have been used to equip a technical library for the engineers of the State of Colorado, so that today Colorado has one of the best technical libraries in the United States.

It is difficult to obtain opinions which represent the consensus of opinion in a given state. However, a partial canvass gave the following results:

Indiana has a registration law. Indiana Engineering Society has endorsed the principle of registration.

Iowa has a registration law. Iowa Engineering Society has endorsed and worked for engineer registration.

Kansas has an engineer registration law. Kansas Engineering Society has endorsed registration. Topeka Engineers' Club is likewise recorded for registration.

Arkansas has a registration law. Little Rock Engineers' Club is for it.

Michigan has a registration law. Grand Rapids Engineers' Club is for it.

10. The hidden purpose of all registration bills is to restrict the number of engineers and thus raise average salaries. There is no indication that it has accomplished this purpose.

10-A. It is doubtful if any professional engineer thinks his profession is adequately recompensed for its services. Naturally all hope that by raising the standards of training and experience required, the members of the profession will be rewarded accordingly. However, the advocates of engineer registration say that registration is not intended *per se* to raise salaries. There are no definite figures to show what effect, if any, registration has had upon wages.

11. Registration would give a professional status to competent commercial engineers who now nearly dominate the building industry. The Florida law makes it a misdemeanor for an engineer to profit from the use of any material in a structure designed by him. The Treasury Department requires that "outside" engineers on the public building program, shall not have any connection directly or indirectly with, nor have any financial interest in any concern providing or handling the products covered by the design.

11-A. The unethical activities of so-called "commercial engineers" can be better controlled under registration than they are today. These "commercial engineers" now claim and are given professional status by the public and many engineering societies. If a registration law were passed and these men were unable to qualify, they would be denied registration and could not engage in practice. Registration will prevent artisans advertising as engineers. Today, no engineering practice is unlawful in the District of Columbia.

12. "Eventually, why not now?" may have been a valid argument ten years ago, but the rate of increase in the number of states requiring registration of engineers has mounted and slowed down with the rise and fall in the fortunes of one engineering association.

12-A. The first engineer registration law was passed prior to the existence of the above-mentioned association. Today, there are such laws in 26 states. Last year four State Legislatures passed engineer registration bills. Two were vetoed; the Ohio law was vetoed because it provided for licensing corporations and partnerships, and the Washington law because it was too drastic. The Kansas and Wisconsin bills became laws. Today, 26 states representing 55 per cent of the area of the United States and 65 per cent of the population have engineer registration laws.

Mathematics and Reality

By Jerome Alexander

Are scientists too much addicted to theory in dealing with practical problems? Applying the pragmatic test.

IN MANY respects the pure scientist has the advantage of his "impure" (shall we say "untouchable?") fellow. The pure scientist may arbitrarily fix factors and conditions, whereas the applied scientist has only Hobson's choice, and must take things as he finds them; but first he must find them. Discovery and due appraisal of the factors operative in any practical problem are essential to success in its solution. Poincaré remarked that a mathematician is never so happy as when he does not know what he is talking about; for he may then deal with hypothetical cases, which may or may not have actual counterparts.

However, we must realize that problems may be solved by making successively closer approximations to the truth; but the mathematical calculations, though impeccable from a purely mathematical standpoint, may nevertheless be based on imperfect or incorrect assumptions and may yield results quite out of line with reason or experiment. Professor Tait, the great mathematician of Edinburgh, whose treatise on physics with Sir William Thompson (Lord Kelvin) is a mine of reference, calculated the maximum distance that a golf ball could possibly be driven, making due allowance for the inertia and elasticity of the ball, resistance of the air, gravity, effect of the blow of the golf club, etc. His son, Lieutenant Tait, proceeded to hit a ball further than that. On checking back to find what factors he had overlooked in his calculation, Tait found that it was the spin of the ball; and he worked out a more com-

plete theory having many curious consequences. A year or two ago a rotor ship sailed into N. Y. harbor, and a rotor airplane is said to be ready to fly.

VERY often whole sciences, or at least certain schools of science, suffer from lack of appreciation of reality, especially of the reality with which the science is supposed to deal. Economics, as taught in mid-Victorial times, dealt with a variety of suppositious entities such as capital, labor, entrepreneurs, supply, demand, etc. Capital was expected to grind down labor to a minimum living wage—but due consideration was not given to labor unions and politics, which often raised the wages of certain selected groups excessively, or to trusts and cartels which sometimes threw local groups out of work entirely, manipulated supply control of output, and stimulated demand by advertising and by high-powered and installment selling.

One big mistake was failure to give due weight to the difference between demand and desire. Economically speaking, demand means desire plus the cost. Our present economic slough of despond is to some extent due to the failure of industry as a whole to see to it that sufficient purchasing power continues to come into the hands of the many. Idle or underpaid workers are poor customers. And one great factor has not been given adequate consideration—workers (and this includes chemists) have votes. That means political power if the votes are cast for astute and honest men. Political economy, as we used to call it, or economics, as it is now called, is undergoing profound changes. Old formulas won't work, because new factors are at work.

All of which shows that circumstances alter cases. Whatever problem you face, always consider the imponderables, the unknowns which Bismarck said were all he feared. And it is better to be "impurely" correct than "purely" incorrect.

A Chemist's Sketch of Fertilizer Manufacturing

By Alexander H. McDowell

A brief sketch of the process of fertilizer manufacture, indicating the necessity for chemical control. A field in which the need for chemists is increasing.

THE manufacture of fertilizers is essentially the mixing of a few out of a large number of raw materials to produce products containing definite percentages of the recognized plant foods, nitrogen, available P_2O_5, and water soluble K_2O.

It is generally required by law that the percentages of plant food be printed on the bag in which the fertilizer is packed. These percentages are known as the "grade" of the fertilizer, and as the sum of them is higher or lower, it is spoken of as "high grade" or "low grade." Commonly the grade is mentioned merely as a series of numbers. Thus, 4% nitrogen, 12% available P_2O_5, and 4% water soluble K_2O is known as 4–12–14. As a variation of this custom, P_2O_5 may be named first and the equivalent NH_3 may be used for nitrogen. The usual factory may ship from a dozen to a hundred or more different grades in a season.

This mixing process is known as "dry mixing" and constitutes the minimum for producing mixed fertilizers. Any chemical reactions occurring are incidental and generally undesired, as they may cause caking or interfere otherwise with the proper physical condition of the product.

In dry mixing considerable ingenuity is required in calculating the formula or schedule of the amounts of raw materials to be used. The amount of each constituent on hand, its analysis, its cost, and the possibility of an undesirable reaction with another constituent must all be

kept in mind. Adjustment to grade is made by the use of inert or low-grade materials.

Since shipments are seasonal, it is customary to start dry mixing and receiving raw material before the end of the dull season. This gives time for unavoidable reactions. The cured fertilizer is screened and bagged at the time of shipment. A comparatively small number of grades are made up for stock, and other grades as called for by sales are made by blending these at the time of shipment, with addition of raw materials if needed.

Strict Legal Requirements Necessitate Chemists

The legal restrictions regarding fertilizers are strict. State inspectors roam about, taking samples at random or at request of consumers. These are analyzed and if not up to grade a fine or other penalty may be assessed. The importance of chemical control at this point is evident. A small over-run may give freedom from trouble with the authorities, but if uncontrolled it may also mean what has been called "giving away the factory." A few tenths of one per cent on a considerable tonnage may run into real money. Some fertilizer raw materials, especially the high-grade ones that are coming more into use of recent years, are expensive, and there is no doubt that in many cases the cost of penalties and over-runs has been much greater than the cost of proper chemical control.

To the dry mixing plant there may be added a wet mixing plant and to that, a sulphuric acid plant. These are both true chemical operations.

In the wet mixing plant phosphate rock is ground and mixed with sulphuric acid to form superphosphate, an important raw material for dry mixing. As a basis for settlements, it has been agreed that P_2O_5 soluble in water or ammonium citrate solution under standard conditions, is regarded as available for plant food.

Wet mixing has as its object the formation of available P_2O_5 from the unavailable rock. The reaction is not completed immediately but continues after the mixture is dumped into the "hot den," where it is held for a period varying from a few hours to a day or more, and for a time after the superphosphate has been "exdenned" and put on the stock pile. Under certain circumstances this reaction may continue slowly for several months. Wet mixing has also been found to be a practical method of increasing the availability of some forms of organic nitrogen that could not otherwise be used in fertilizers. Recently low-priced nitrogen in the form of gas liquor or even anhydrous NH_3 has been fixed by adding it to superphosphate either during or after wet mixing.

Sulphuric acid manufacture needs no description here. The lead

chamber system is general, as the strength of acid used for wet mixing is rarely below 45° Bé or above 55°.

This skeleton sketch of fertilizer manufacture exhibits so many possibilities for chemical control of raw materials, goods in process, and finished product that it seems unnecessary to point them out. With the growing trend toward higher grades, both in materials and mixed fertilizers, there is also a growth in the importance of such control, and hence increasing opportunities for chemists in the fertilizer field.

Proper Emphasis

WHEN a student has reached that stage in his study of chemistry where he recognizes that the subject has several subdivisions, he frequently asks for advice regarding selection. His questions are asked in good faith, with the best intentions, and are entirely proper. He wishes to know which line of work will be most likely to provide an opening for him when he leaves college, which will offer the highest remuneration, and which furnishes opportunities for rapid promotion. The study of those subjects which promise to lead to practical applications is a viewpoint that the student often emphasizes, because these seem to him the most obvious results of chemical work.

To answer the inquiries of such a student the adviser should be careful to avoid prejudice in favor of his own field. Regardless of what his particular interests are, he must not forget that a broad training in fundamental subjects provides the only foundation upon which any worth-while superstructure can be built.

It is true, also, that many graduates must enter fields in which the work is quite different from that for which they prepared. In these cases a knowledge of principles is the indispensable tool with which they must carry on. The adviser must also keep in mind the fact that such catch-words as "learn to do by doing" and many others that might be quoted, may lead only to narrow specialization and end in the practice of a few routine mechanical operations, with little understanding of the principles involved.

Finally, it must be recognized that "in the final analysis, the thing in this world which is of most supreme importance, indeed the thing which is of most practical importance to the race is not, after all, useful discovery or inventions, but that which lies far back of them, namely, the way men think, the kind of conceptions they have about the world in which they live and their own relations to it." This is applicable to chemistry as in other divisions of knowledge. L. C. R.

A Business Chemist

By Leon V. Quigley

The story of Foster Dee Snell, one of the able younger men in the consulting field. A combination of common sense and science as applied to business.

THE outline of this biography is as different from the usual as is its subject. After all, biography is a rewarding adventure for the reader, because, whatever the content, it is a picture of experience at which we are privileged to look without paying the high individual admission exacted by the school of life. As we all know, a biography usually includes a first part, in which the subject is finding himself by orientation with the world at large, a process which begins at birth. There is an interesting intermediate section in which a career flowers to full stature and does its best work and broad service. There is usually a final chapter which shows the subject indulging in hobbies and looking back at accomplishments well won. Granting that we have drawn up chairs before the fireplace and are discussing informally the work and personality of a man who is distinctly a contemporary, and not bewhiskered or brow-furrowed with the passage of most of a century, we know that chief emphasis will be given to the intermediate chapter; that is, to the period of active, productive work. The most interesting impression one gains in writing an account of Foster Dee Snell is that of a life plan and purpose early established and consistently realized.

Stories of childhood always go over well. Foster Snell made his first howl for food at Binghamton, New York, on June 29, 1898; but apparently only a mother could find anything unusual about the days until he went to college. If he took any prizes, he has forgotten them

along with the Latin and ancient history he learned in those years. But in 1915 he entered Colgate with a nebulous idea that he wanted to be an organic chemist and to work on dyestuffs. Despite interruptions of minor military experience, he graduated in 1919, with the average complement of chemical information of a B.S., no more and no less. He says that by that time he had learned that the name for his idea was Synthetic Organic Chemistry but that this word-label of an ideal was almost formidable enough to make the idea fade.

Man is a creature of circumstance. Industrial opportunities were not abundant. A kindly professor told Snell that rather than take any job that offered in the laboratories of industry he might do well to use a few years in post-graduate study. The professor's advice was followed; but let us first consider how his summers had been spent.

In analyzing a good many careers, the writer has been impressed by the experience and influence created by summer vacation occupations which intersperse college years. During several such summers Snell was a salesman for a well-known firm of seedsmen. He used the sales experience thus obtained in getting his first industrial job—for two summer months at the Binghamton Gas Works. He remembers getting a raise at the end of the first two weeks—of one dollar per week. After the two months he resigned to go to Albany, where he spent the remainder of the summer collating some notes he had made, into a thin volume entitled "Colorimetric Analysis." This was the first book published on that subject, which was then on the threshold of a great expansion in application. The first volume of a revised edition, published in collaboration with Mrs. Snell, will appear this fall.

HIS first book scheduled for publication, Snell went to New York. The maw of Columbia swallowed him. Between teaching general chemistry there and teaching at Barnard School for Boys, he took a few graduate courses. The next three years he taught under Charles Baskerville at the College of the City of New York. Simultaneously he carried to completion major and minor courses, also a research project. The basic theme of the research was dihydrothioparatoluidine, a horrid word, but a favorite subject in those days for Doctor Bogert's researchers. He admits that he did something with zinc salts of thiophenols which is still occasionally mentioned in the sacred pages of *J. Am. Chem. Soc.* as a basis for some syntheses. It never merited any medals.

In 1921 he married Cornelia Tyler, a graduate of Syracuse University. To one familiar with the Colgate-Syracuse rivalry this sounds like the

friendship of the lion and the lamb. At any rate, he says that Cornelia Tyler Snell did most of his research under his direction. He got the Ph.D. that was awarded, so that Mrs. Snell later had to complete a research problem of her own to get a Ph.D. for herself. Subsequently as chemist in charge of the pediatric research laboratory of the Fifth Avenue Hospital, Mrs. Snell seems to have found a valuable application of her scientific background. But with regard to Dr. Foster Snell's research organization, it is not a family affair, and Mrs. Snell is not on the staff.

Going back to the early pedagogical days of our subject, we find the now doctor of philosophy recommended by Herbert R. Moody to Allen Rogers to fill a vacancy at Pratt Institute. He got the job. For the succeeding five years, until he resigned in 1928, he was in charge of the work in technical chemistry in the day session and instituted a course in organic chemistry in the evening curriculum.

ABOUT 1919, while Dr. Snell was teaching at Columbia, a friend came to him with a wonderful material which, when sprayed on coal, increased the heating value by several per cent. Careful examination under controlled conditions showed the claims were not justified. This commercial application of chemistry was the birth herald of the present organization which Foster Snell has built. Even then it suggested to an active mind a relatively new field of endeavor in which science and commerce could meet very frequently and perhaps with profit.

The following year our subject, still teaching, was requested to examine a shipment of lace to determine whether it had been damaged by sea water. The Snell report said that water damage was unquestionable, but the absence of sodium chloride, in either shipping cases or in the fabric of the lace itself indicated that whatever aqueous contact had been established was with fresh water.

Then followed occasional and miscellaneous analytical and consulting jobs until, in 1923, development of methods for treatment of industrial waste from plants in the Passaic Valley furnished some dozen or fifteen fair-sized problems. This influx of consulting work, to one already busy with a teaching schedule, justified the services of a part-time assistant that year, and of a full-time assistant the year following. Special sections of this work have been published with various coauthors as a series under the general heading of "Treatment of Trade Waste." Simultaneously with these advances, the Snell mind became fascinated with the possibilities of applying chemical facts and methods

to the problems of small manufacturers. Perhaps their products could be improved—new ones developed. Perhaps a general consulting and advisory service would be welcomed, if offered, because it would keep the small manufacturer up to date in technical matters and might give him a profitable lead in his field.

This idea brought instant response, and in 1925 Dr. Snell found it necessary to open a separate laboratory at 35 Myrtle Avenue, in Brooklyn. Gradually the volume of work seemed to Dr. Snell to justify his giving exclusive attention to it. Accordingly, he relinquished his post at Pratt Institute and opened an office at 130 Clinton Street, Brooklyn, New York. By that time the staff had grown to a point where "he" could no longer be properly referred to as "they." From this point, the story is well known to many of our readers. Most people describe any new enterprise as a venture. Well, this venture became a business, and rather sizable in its classification in the United States. The staff grew in numbers and, with the acquisition of specialists in several fields, the scope of the laboratory was broadened and its publications entered diverse fields. At present there is a little magazine called *The Chemical Digest* which reflects the manifold interests of the present group.

Silicates and acid-proof cements were the basis of research projects, and later of publication. Soap and allied detergents have been a field of special interest, as indicated by Dr. Snell's recent papers on "Detergency of Alkaline Salt Solutions," now being published by *Industrial and Engineering Chemistry*. There have been, of course, too many topics to warrant present listing, but typical examples might be magnesia cements, lime mortar, glass for blackboard use, even the physical-chemical aspects of hair waving.

In 1929, the organization first took over the supervision of operation of a manufacturing plant. Two other similar assignments followed close upon the first. Both office and laboratory space were doubled. At present a staff of eighteen is required for the company's activities.

In 1930 Foster D. Snell, Inc., was formed to handle the total consulting activities. Dr. Snell has built up an organization or group of men who, while separately recognized in their fields, are interested in group cooperation to a remarkable degree. The best testimony of team work and unity of purpose is reflected in the cooperative spirit of good fellowship both actual and visible. They all seem to like their work, and the definitions of vocation and avocation seem to merge in this happy technical family.

BUT, after all, since a business is but the lengthened shadow of a man, we have a personality to indicate. Dr. Snell's interests are so diversified that as a conversationalist he is neither pedantic nor limited. Whether explaining intricacies of banking, interpreting the vagaries of stock exchange fluctuations, or commenting on the political situation, he gives one the impression of a keen observer who possesses the happy faculty of assimilating practically one hundred per cent of the possible deductions after a brief contact with any set of facts. He seems able to combine the scientific aspect with the practical application. More particularly on close association, his personality becomes fascinating and colorful. One understands that ability and ambition are nicely balanced, and that optimism and conservatism are well blended. Socially he is a very good mixer, and we use this time-honored expression with careful regard and with the intention of multiple accuracy.

In considering Foster Snell's mental reactions and the relation they may assume to the success which he has already achieved, the biographer is impressed with what is an apparent ability to apply rapidly and skilfully inductive and deductive reasoning. For instance, his technique in dealing with a technical problem is not invariably the Edisonian method to the exclusion of all others. To be sure, the Edisonian cut-and-try method is utilized for certain problems but in many another problem Snell is apt to take it apart right away, by a process of mental analysis.

Suppose an automobile polish is to be improved. Right away questions will be asked which will bring out principal features of service which are expected. The next inquiry will be: How nearly does the polish meet, or fail to meet, these specifications? You see, up until this point of the reasoning, chemistry may not have been specifically mentioned. Then, with the problem laid open from the standpoint of every-day business language and common sense, it will be again reviewed from the standpoint of chemical information and the use of chemical tools.

This biographer would say that Snell was a specialist in translating the practical fundamental of every-day things into terms of chemistry, particularly physical chemistry. He seems also to possess a useful sense of inter-relation. He ties up hair-waving technique and soap-building by the statement that he saw fit to patent part of his work on detergency—but in reference to waving hair. He relates acid-proof cement to sodium metasilicate by the statement that the former depends on the latter in a lower stage of neutralization which accentuates

certain properties of the silicate and lowers others. Development of a color for branding coal, from a base for a plastering material, was postulated on the similarity of the colloid chemistry of the two problems. Critically speaking, this selective viewpoint and appreciation of the relativity of things seems to guarantee useful participation in diverse fields. To speak practically, it seems to get results.

EVERY man must have his hobbies. Professor William O. Swan says that he changes his every five years. Apparently Dr. Snell does also. In college it was winter sports and tennis. Later it was golf. At present it is bridge, as the regulars at the Saturday sessions of The Chemists' Club can testify. Our subject has the usual complement of professional affiliations; and among these, which are literally too numerous to include in this brief account, we might mention that he has been secretary of the Perkin Medal Award Committee since 1928. Since 1925 he has been honorary secretary of the Society of Chemical Industry. At every semi-annual national meeting of the American Chemical Society you will find him filling the unforgiving minute full of all that the program offers, and on some one of the days he is sure to be presenting a paper. When you chat with him, you will find that he is neither meek nor particularly mild. You will enjoy him in argument. He is quick on the comeback, forceful but not noisy in making points.

In this biographical sketch we trace the outline and sketch in some of the high lines of background and environment. You will develop the more complete picture supplying your own detail between these lines. The writer reminds, however, that in spite of distinctions or success, it is still true, even as of yore in Scotland, that a man's a man for a' that.

Should Chemists Be Registered and Licensed?*

By Edward Gudeman

The need for licensing. Labeling the profession with its own degrees? An early recognition that there was no one to handle the problem.

NECESSITY for the proper recognition of the chemical profession, to me, is not a question open to argument. It is a required constructive protective problem. If it is a question at all, it can only be answered in the affirmative. There is no negative core to this problem. No one denies that something should be done to place the chemical profession where it really belongs and to give to it the standing it has earned.

Individual, generally personal and business, considerations are out of place, as we must take existing conditions and consider where we stand in the eyes of the public. We cannot be critical as to our individual standing today as a profession and to those in it, even if not of it; we must grant equality, whether it exists or not, as to scientific standing and ability, and then gradually change the existing conditions for the better. We are in no worse position than were the medical and legal professions before they had to toe the marks of registration and licenses to obtain legal status.

Registration and license, with the proper requirements and safety guards to obtain them, will give to the chemical profession some recognition, and in that way place this profession on a parity with other scientific professions, such as medicine, law, pharmacy, engineering, and dentistry. How many will place themselves knowingly in the hands of doctor or lawyer who has no license and is not registered to practice the profession? We cannot be married without a license, common-law marriage in some states being the exception; we are not legally born without being registered, and even the undertaker must have a license before he can bury or cremate us. I grant that we seldom bother ourselves to make special inquiries on these points,

* Excerpts from a paper read before the American Institute of Chemical Engineers in 1919 and printed in that Institute's *Transactions*.

as we take it for granted that the professional men and women, directly or indirectly involved from the day of our birth to the hour of our burial, have a recognized legal right to perform the functions of their professions. We feel safe in knowing that if they have not, they are subject to indictment and punishment. In effect licensed, registered, ordained, permitted, or admitted to the bar, are similar terms, conferring some fixed rights or privileges.

SOME of us who have felt our absence of legal status have tried to supply it by taking chemical or other scientific examinations, not with the intention of being appointed to office, simply to be placed on parity with such "qualified" or "recognized" appointees. A similar effect is produced by those connected with educational institutions, who use their positions as badges showing a qualified and recognized scientific standing. I admit making use of both subterfuges, a compulsory requirement to satisfy some clients who want me to "qualify" as an expert.

How often do we find in court proceedings, or at hearings before commissions or committees, that a federal or a state or a municipal chemist qualifies as having passed an examination to obtain the official position he holds, and how often do teachers or ex-teachers qualify as such, the only object being to get the prestige or the recognition that goes with the statement, indicating a standing in the profession, which may give some extra weight to the statements or testimony. To counterbalance the effect produced many experts qualify in a similar manner, even against their own inclinations. If the chemical profession were recognized, membership in the profession would be qualification complete.

If the chemical profession were legally recognized, chemists could be held responsible for what they did and for what they said, and direct breaches in professional conduct could be properly dealt with. Without the least bit of professional responsibility resting on the chemist, consider how often he is called upon to advise on matters affecting the health and welfare of individuals or communities. How often are chemists called upon to advise, perhaps even decide as to the actual liberty or death of a fellow-being? Such decisions come to many of us as common occurrences, and why should not we be held responsible for our professional actions? Why should we be in a different position from physicians, druggists, engineers, lawyers, or any other professional man or woman who may have to decide on similar questions?

A physician giving a wrong treatment can be held for malpractice.

Carelessness of a druggist or engineer makes him subject to criminal indictment. Unprofessional conduct by a lawyer may close the court room to him, and he can be disbarred from practice. The right to use the term doctor or druggist or minister is prohibited in many cases, unless one is registered or licensed as such.

ANY ONE can call him or herself a chemist, act as such in civil or criminal cases and by qualifying as a chemical expert become a privileged witness and give an opinion. Being a chemist means nothing specific in the eyes of the law, as our profession is not a recognized one. How often are we asked to define what a chemist is? After having qualified as a chemist we are proof against any indictment and punishment, even if our reports or statements or testimony is absolutely false, as long as no proof can be brought showing that we testified falsely with intent to deceive. Lack of knowledge or experience is not considered, as long as we don't wilfully and knowingly perjure ourselves. All that we have to do to escape responsibility is to give our chemical expert opinion, claim it as our own, and stick to whatever statement we have made, correct or otherwise. No doubt many can give better and more appropriate examples than the following: In a court case Mr. X was accepted as a qualified chemical expert, having qualified himself as a professor in a medical college with a medical degree and many years of practical chemical experience. He then testified that a product withdrawn hot from the furnace and allowed to stand in a cold room for twenty hours was being continuously heated during this whole time outside of furnace, admitting that no chemical reaction took place producing heat. Confronted with printed authorities showing the fallacy of his statement, the witness stated that he was the authority for that opinion, and above any authority that any one could cite against him.

This expert held no chemical degree, but his opinion stands as part of the court record, notwithstanding that the presiding judge dismissed this witness without allowing any cross-examination, having the record show that the judge did not believe this conceited chemical expert, and was sorry that the court could take no further action, as the witness had no professional standing, as a chemist, of which he could be deprived. In asking for a new trial, on appeal, these remarks of the presiding judge were quoted to show error and prejudice against this witness. If our profession were recognized, such a witness might not have been accepted as an expert, and even if he had, this court record could be made the basis for some action leading to his future disquali-

fication, through cancellation of registration or withdrawal of license, or whatever mark he had showing him to belong to the chemical profession.

From another case, tried within the last few years in the Superior Court of Illinois:

Question to the Plaintiff.—"Are you willing that a chemist, to be named by the court, without consultation with either party and whose fees shall be paid by the defendant, should take this sample . . ., analyze it chemically, and come here and report what he finds?"

Answer by the Plaintiff.—"I don't know that I am willing that the head of the chemical department of either Northwestern University or of the State University of Illinois, or of Armour Institute of Chicago, any of the three, should take this sample. I want to make further investigation before I leave it to anybody." (The University of Chicago and Rush Medical School were later added to the excluded institutions. The plaintiff played no favorite in barring all local institutions.) "I have read all the reports of Congress on the question . . . that were before the Pure Food Commission at Washington. That threw such suspicion at all chemists that I wouldn't trust any of them until I looked them up pretty well. I cannot name any chemist in the United States to whom I am willing this sample should be submitted. My objection is to chemists in general all over the United States, following pretty closely . . . decisions on that. If I could find a chemist in the United States who would be available during this trial, who could satisfy me I can get a good honest analysis, I would willingly submit it to him. I haven't any such chemist in mind. So far as I know at this time there is no person whom you could name or any one could name who would be satisfactory. There is not any chemist in the United States, so far as I know, who is available or within reasonable distance of Chicago, so that he could make the report suggested while the case is on trial, to whom I am willing to submit this for analysis."

This case was on trial for some weeks. The analysis called for would not have taken much time—a few hours perhaps. It was qualitative, requiring no special reagents or complicated apparatus, and no extra amount of chemical knowledge. Within forty-eight hours chemists could have been brought to Chicago from St. Paul, New Orleans, Washington, New York, or even Boston and the analysis could have been made in any laboratory.

In the Chicago *Herald Examiner* of May 22, 1919, there appeared the following editorial headed "THE NATIONAL RESEARCH COUNCIL:"

> Dean Angell of the University of Chicago, recently asked to be president of the University of Michigan, has accepted the position of president of the National Research Council at Washington.
>
> The purpose of the council is to promote research in *mathematical, physical and biological sciences*, and in the application of these sciences to *engineering, agriculture, medicine and other useful arts*, with the object of increasing knowledge, strengthening the national defense and contributing in other ways to the public welfare.
>
> While the War was going on the council had direct charge of all experiments for war purposes. Under its direction discoveries were made which were worth armies. Its workers increased the range of five-inch guns by seven miles, and their accuracy eight times; introduced wireless telephoning for airplanes; *developed the manufacture of gas to a point which, if the War had continued, would have staggered the world; revolutionized the American dye industry*, and in a hundred other ways made American science the wonder of other nations.
>
> Now in peace it means to continue its organization and, if possible, its successes.

You will note that mathematical, physical, and biological sciences are directly mentioned. Reference is made to the manufacture of war gases, and the revolutionizing of the American dye industry is recognized. I do not know whether Mr. Arthur Brisbane wrote this editorial, but whoever did does not seem to know that such a thing as chemical science exists, and that there are a tribe of professionals who designate themselves, without any legal authority, as chemists. We cannot wholly blame the laymen for the non-recognition of our profession. What is granted to us after completing a college or university course in chemistry? A degree of bachelor in science or philosophy, with or without mentioning that chemistry was our major study. Judging by my own diploma, certifying to the granting of the degree of doctor of philosophy, no one can tell whether it was granted because I wrote the great American novel or for finding the origin of the Sanscrit alphabet or whether it was accidentally due to some extra work in chemistry.

We grant specific degrees to engineers, even to sanitary and chemical engineers. When one graduates in law, medicine, pharmacy, dentistry, theology, or veterinary science, the degree mentions them, and it is so stated on the diploma or certificate issued. Why should not the chemical profession have its own degree, instead of being buried under a "science" or "philosophical" tombstone? We are no more bachelors or doctors of philosophy than we are of law, medicine, or theology.

If our educational institutions do not specifically recognize us by our own name, we certainly cannot expect recognition from laymen. Does not the chemical profession deserve this institutional recognition and this protection? You can substitute any other designation you prefer for "registration and license." Some other name may sound sweeter, but we must decide on a something, some card, tag, insignia, or label, which identifies our profession, which carries rights and privileges and responsibility, without which no chemist should be allowed to practice, and which can be annulled if we do not live up to at least a minimum standard of professional chemical ethics.

MEMBERSHIP in chemical societies, with or without codes of ethics, are not sufficient, and carry little weight, attach no responsibility to a professional chemical standing, and do not indicate scientific ability or integrity. I say this with a full recognition that our Institute* requires scientific standing to enter it and also has a splendid code of ethics, limited to our membership, seldom made use of, perhaps not even enforceable. You know well that many of our fellow chemists sneer both at our entrance requirements and at our code and that numerically we are not strong enough to have them given much consideration by outsiders. We can initiate a move to bring about a proper recognition of the chemical profession. Perhaps we are not the proper force to do this, for although many of our members are chemists, still our Institute is composed of "chemical" engineers, our chemical part being adjective. Membership in many "scientific" societies used as qualification as to chemical or other expert standing is often a farce. Some time ago a very well-known American chemical expert qualified as a member in some ten to twelve scientific societies. He omitted to mention our Institute, but made up for this by mentioning the National Geographical Society. On cross-examination it came to light that only one of these societies required a scientific standing, and of this one he was an honorary member. We all know that the only requirement to join most chemical societies in this country and abroad, is the inclination and ability to pay the annual dues.

Within the last few months many of us have been given proof of the urgent need for some real recognition of the chemical profession. Many of us have received applications from chemists who for a time were in the employ of our government. Not alone in these applications, but in notices and in advertisements in our chemical and trade journals,

* The American Institute of Chemical Engineers.

do we find stress is laid on the fact that the applicant or the one returning to civic duties has been in government chemical service. It is a sort of official recognition that they have the right to call themselves chemists, showing that they belonged to a specific profession.

A league of those who have had the honor to wear the chemical warfare insignia will bring about for them a proper recognition, good at least for one generation, and will make all other chemists, outside of this select circle, do something to get some kind of recognition.

IF THE chemical profession is on parity with other scientific professions, it should have some official and legal standing, and it makes no material difference how this is brought about and how it is certified to, whether by license or registration or any other act. If our profession carries responsibilities as great as those of other scientific professions, and no one denies this, we should have similar rights and privileges, including some chemical court of honor, where these rights and privileges can be curtailed, suspended, or annulled, if necessary. The fact that lawyers and physicians are registered, licensed, or admitted to practice has not lowered the dignity of these professions. It has perhaps added dignity to their professions, and the same will apply to chemists.

State acts recognizing the chemical profession, through proper examination or otherwise, would create no hardship on any of us, and would be of direct benefit to most chemists and all chemical industries. It would prohibit every Tom, Dick, Harry, Mary, or Jane from claiming to be of our profession. Today we get less hearing and attention than a baby, whose presence and existence are recognized, even away from its own home, if only through its howling influence, often in evidence during the dark hours of the night. The chemical profession has been satisfied to peacefully slumber in the darkness of non-recognition. We should wake up and set up a mighty howl. To pacify us, we will be fed on recognition. What this specific diet is to be called, can be decided later.

Colonel F. M. Dorsey is in accord with some action, as he wrote to me on May 5, 1919, as follows:

"I do certainly agree with you that the chemical profession should be legally recognized, but am sure that I do not know, at the present time, how this should be done. I am a member of a committee for the American Society of Ohio, which has for its function the following of legislation on this point. There are so many angles to the problem

that I have not at this time reached a conclusion as to how it can best be solved."

As Colonel Dorsey says, it is a great problem worthy of grave consideration. I doubt whether any one today can solve it to the satisfaction of every chemist, but I believe we can start in on it, acting with representatives of other chemical societies. It certainly should not be a difficult task to get at least degrees in chemistry from our educational institutions, which would be some recognition and some protection.

IF WHAT we call chemistry is only a handmaid to other scientific professions, then nothing further need be done, and we can continue to sit in the back row. But if chemistry is a real profession, able to bear its own burdens and have responsibilities, then it is about time for the profession to get the recognition and the legal standing due it. A former president of the American Chemical Society some years ago said: "We have in this country the capital, the enterprise, and the chemistry for great industrial achievements. That we cannot thus far point to them is due to the fact that with us chemistry is too often left like Cinderella sitting beside the ashes of the laboratory furnace, while her two haughty sisters drive to the industrial ball." Today I believe that Dr. Little will not object to my finishing his chemical fairy story, by saying that Cinderella Chemistry has been to the ball and made a world's sensation. The Prince of Opportunity has found her and has married her. He is now leading her home to give her the position due her in scientific society. Two homes are open to her, one containing the registered and licensed fellow scientists, and the other offering the recognition and protection of the labor unions. You can choose for her, which will you take?

Chemists' Salaries and Tenure*

Views of the British Association of Chemists; a 14-year-old professional organization and what it has done in England.

IN OUR issue of September 16th we published a letter from "Equipollant" in which he asserted that the salary paid to the average works chemist is disgracefully low in proportion to his qualifications and

* *The Dyer and Calico Printer*, Sept. 30, 1932.

the responsibilities of his work. Moreover, the tenure of the chemists' appointment is, according to our correspondent, all too uncertain.

We have received some interesting notes from the British Association of Chemists which do not in the least accord with the statements of "Equipollant." The conclusion to be drawn is that it is the chemist's own fault if he is not drawing a reasonable salary. The question of tenure is more difficult; in these days of economic stress there are undoubtedly cases of middle-aged men being thrown out of positions they have held for many years, through no fault of their own—or of their employers.

One hopes, however, that there are very few instances of the chemist being the first person asked to terminate his engagement. This matter is rather outside the ordinary question of tenure; a chemist can hardly feel that he has a grievance against his employers if he is dismissed simply because there is no work for him to do. Further, he is entitled to at least three months' notice.

In every industry and profession where conditions of employment are bad the reason is nearly always to be found in the fact that the employees have not organized themselves. Chemists have banded themselves together and as a result their status is steadily improving. For 14 years past the British Association of Chemists has been energetically fighting cheeseparing and unscrupulous employers. It aims at a minimum salary of £350 per annum for full members, with proportionate remuneration according to age, qualifications, and experience, the salary also varying according to the degree of responsibility and the size of the works or company.

The Association states that there are well-established concerns where the salary of the chief chemist may range between £1000 per annum to £3000 per annum. There are also numerous cases of smaller companies where £500 to £950 per annum is paid and is reasonable for the status and responsibility. The Association expects the young graduate to obtain a commencing salary of £250, but if a very brilliant research worker he may, at the age of 25 or so, start at £450 or even £600. These instances are not common, but have happened within recent years. A number of men of the age of 27 and 28 have, through the B.A.C., been appointed at salaries of from £450 to £500 per annum, with the prospect of substantial improvement.

These men have brains to sell and they have also developed what may be termed a commercial edge to the mind, in addition to being thoroughly competent chemists. They can convince the employer that their services are valuable and the employer appreciates the man who,

being able to look after his own interests, is most likely to carry a responsible position with advantage to the company employing him.

DURING this period of depression the Association has emphasized the fact that employers are looking for the best trained men and are willing to pay reasonable and adequate salaries for their services: but adequate salaries cannot be gained if twenty applicants are each trying to cut salary to get the appointment—which, after all, can only be held by one man.

For instance, one employer recently asked twelve men—each asking £600—to attend for interview. The first man to see the director afterward informed the Secretary of the B.A.C. that, although he was confident he knew more about the work than any of the other applicants, his first words to the director were: "I would like to amend the salary in my letter from £600 to £450." His idea was that he would then be appointed on sight: he overlooked the fact that his speech showed his lack of confidence in his ability to do work to the value of £600 per annum. He was not appointed. Employers want men with confidence in their own abilities.

As regards agreements, a simple form of agreement is desirable as a general rule, or at least a letter of engagement stating the salary and terms of notice.

In the absence of any specific agreement or evidence to the contrary the professional chemist, who is a member of the B.A.C., obtains three months' notice, or salary in lieu of notice; *per contra*, he is expected to give three months' notice if he desires to terminate his appointment. Several cases have come before the courts, and His Majesties' Judges have always upheld the Association's claim that the chemist is a professional man (as one Judge stated, he cannot be classed with gardeners, chauffeurs, and parlormaids); therefore, three months' notice is reasonable, since these appointments are not to be found at a moment's notice. In fact, many agreements insist on six months' notice, if no more, and several claims based on six months' notice have been settled by negotiation. A very large number have been similarly settled for three months' salary, as the wise employer has regard for the precedent established for members of the Association.

THE Association is continually accumulating evidence of a confidential character, but from the facts recorded it is possible to advise members on what salary is reasonable for a certain position knowing something of the works and industry. Chemists cannot know

these facts and, therefore, as "Equipollant" indicates, their views on salaries are restricted; they have nothing to aid them to form a correct opinion, and being content with their splendid isolation must inevitably fall below the general status.

The Association looks for fair terms and a square deal on each side and if all the chemists in the country could realize what a delightful spirit of friendship can exist where there is confidence and self-reliance all the time supporting the status of their profession, they would no longer take the risk of standing alone.

The Unemployment Insurance Fund of the Association has helped scores who might, without that aid, have lost status. This, with an Appointments Bureau service, which is valued by employers, is something very definite when the need arises. Chemists have it within their own hands to help themselves, but they cannot advance if they will stand aloof from their fellows.

If some 1500 can achieve the results accomplished by fourteen years' work through the B.A.C., how much greater would the advance have been if the 10,000 chemists (which are estimated to exist) had all been working for their economic advancements during this period?

Even the man in the street would then know what a chemist's work represented. Today, many small company directors have hazy ideas as to whether they ought to employ a chemist; they do not realize that the right technical man would place their company right ahead of rivals and for that reason alone is well worth his salary.

Fair terms would be the order of the day in all directions, there would be more openings for technical employment, and so the whole country would benefit.

Recent advances in British chemistry have meant the closing down of foreign rivals who could no longer compete on quality and price; men who achieve these results are well paid.

"Equipollant" asked if anyone could possibly see the slightest hope of a new position for his friend, who had lost his position as works chemist, which he had held for twenty years. If this man was a member of the British Association of Chemists he would be sure of receiving three months' notice, he could obtain assistance from the Association's unemployment fund, and he would be assisted by the Appointments' Bureau—by no means a black outlook. The whole difficulty lies in the slowness of professional workers to join forces.

BY-PRODUCTS

Authority

THE good fortune or the obscurity that has hitherto enabled us to escape the stake and fagot prompts a discussion of another of our pseudo-heresies, that concerning authority. Aware that scientific men, at least since the generation of Galileo and Bacon, have declared their defiance of anything smacking of authority, an unsophisticated consideration of thoughts and things leads to the belief that even among factual fanatics authority still exercises considerable influence.

We read the dictum of a great philosopher to the effect that since we must ultimately rely upon faith, knowledge of the absolute being undemonstrable, the important question is, in what shall we place our final unquestioning confidence? The scientific man relies on the constancy of law, order in the universe (or cosmos instead of chaos), validity of sense impressions, integrity of the human mind, and the actuality of knowledge. He denies faith any place in his systema natura. Rigorous criticism, however, such as Locke or Hume might have applied, would dissolve these apparently impregnable foundations into the thin mists of bland and childlike empiricism.

Much of our confidence in the ultimate validity of our scientific concepts arises from their consistency when subjected to mathematical analytical reasoning. The appearances are that the mathematicians have builded upon solid rock and are even less susceptible to the faith-destroying criticism of the logicians than are the physicists. This turns out disappointingly, for the hardened analyst hastens to show that all of the conclusions of the mathematician, past and future, are contained in his definitions; and the analyst proceeds to demonstrate the assumptive character of these. The great success of mathematical reasoning, he asserts, is due to the conceptual character and complete definition of its axioms, in which it is rivaled only by theology and the common law. He discourses gleefully on the bewildering effects of non-euclidean geometry and curved straight lines and similar irritant topics.

The chemist might have remained calmly indifferent to the controversy had the physicist not robbed him of his atom and returned a handful of electrons about which he will guarantee nothing, not even their location and velocity. It is all very confusing, as Septimus would say, except that in revenge the chemist may look with unsympathetic com-

placency at the physicist vainly searching for a foothold in the face of the Heisenberg principle, wave mechanics, and the theory of probabilities. Has not the physicist himself destroyed the authority of nature? And is this why he abandons nature and flees to the refuge of mathematics?

Disappointed in these directions, where else may we seek conclusions that will prove secure and acceptable starting points? We return to our heresy. It seems probable that, so long as our nature is human, the majority of mankind will live and think by reference to authority; and it will continue to test the trustworthiness of principles by the numbers and characters of those who entertain them and by the vigor and assurance with which the principles are expressed. It does not appear that anything can be done about it.

They Say

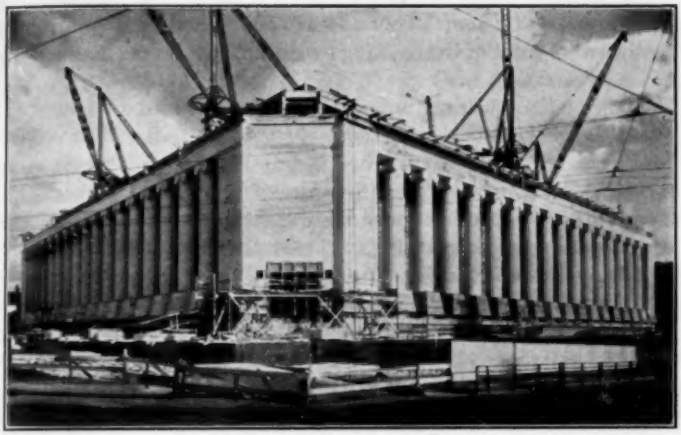
"SURELY the greatest lesson of the history of science is that of the need of tolerance. For it teaches (does it not?) that there is no finality in human thought, that even the latest phase of science is not the last word, but only an episode in the history of man's endeavor to understand and control natural events."—PROFESSOR A. WOLF

"No real theologian is afraid of any damage from the operations of nature or of natural reason rightly investigated, for these very things bear upon them the light of the Creator Himself."—POPE PIUS XI

"In our hearts we know science for what it is—the greatest frivolity of history. . . . If it was not that science enables a lot of people to get rich it would now be what it was before: the amusing hobby of charming old fools."—ERIC GILL, "Clothes."

—*The Autocratic Chemist*

New Building of Mellon Institute



THE Mellon Institute's new home, now in course of construction in Pittsburgh, is approximately one-half finished, and will probably be occupied by the institution during the close of 1933. Messrs. Janssen & Cocken, of Pittsburgh, are the architects; and the Mellon-Stuart Company, also of Pittsburgh, is the general contractor.

The building occupies the former site of the Institute's Building No. 2, at the corner of Fifth and Bellefield Avenues, on the square adjacent to the land around the Cathedral of Learning of the University of Pittsburgh. The new edifice is designed on classical lines, a plain, simple, but massive structure, surrounded by monolithic columns. The entire exterior is being built of Indiana limestone. At present the columns have been erected on three sides of the building, and it is thought that all the stonework will be finished by December 1st. In all there will be 62 columns, each of which is $36^1/_2$ feet in length, $5^1/_2$ feet in diameter, and 60 tons in weight.

In this new home of Mellon Institute ample space will be provided for housing many more industrial fellowships than the 60 that now tax the Institute's facilities to the utmost; and the other departments of the institution, particularly the library and the department of research in pure chemistry, will be increased in proportion. There will be about

four times as much laboratory space in the new building as there is in the present quarters of the institution.

The new building is Ionic in style. It will be eight stories high, and its dimensions are approximately 300 feet square. The main entrance will be located on the fourth floor and will be reached by steps extending along the entire front of the building on Fifth Avenue. The laboratories will face on interior courts.

The new building will not only provide a greatly increased number of laboratories for the Institute's industrial fellowships but will also contain many special laboratories. Library facilities will be greatly expanded. There will be ample room for caring for 200,000 books. Other special features to be included are much more elaborate chemical engineering laboratories, large and small lecture halls, an industrial fellowship museum, and a suite of rooms for the Robert Kennedy Duncan Club (the social organization of the Fellows of the Institute). Certain rooms will be equipped for special fields of research, such as spectroscopy, electrochemistry, radiations, low-temperature studies, high-pressure experimentation, etc.

Little Enzymes

By Cosmic Ray

Lots of the chemistry we learn at school is as easy to forget as the bread in the toaster.

At last we've been told the formula for leather. It's the ox-hide of beef.

After Ethel took to dieting, they called her Ethylene.

It takes but a brief inspection of almost any family tree to show that it needs some tree surgery.

It's funny how many peroxide blondes one finds sitting in the bleachers.

No, Uriah, bay windows are not made of water glass.

When the frost is on the pumpkin, Pyrex many chemists' stomachs. (Take your time.)

"Combination shot," said Florence Flask as she leaned too far over the billiard table.

BOOK REVIEW

Profitable Practice in Industrial Research. Edited by MALCOLM Ross with the collaboration of WILLIAM SPRAGEN and MAURICE HOLLAND. *Harpers.* $4.00.

This collection of articles by fourteen of the leaders of industrial research is possibly the most valuable book for chemists that has been published in a long time. These men have something to say; and the National Research Council wisely has each tell his story briefly. Eighteen pages seem just the right length to enable a research director to omit the padding that makes a full-length book dull; on the other hand, the writers have presented sufficient facts to keep the book from being a collection of mere generalities.

Most of the chapters are extremely well written, varying from the vivid, sometimes almost colloquial style of Charles F. Kettering to the more leisurely treatment by Frank B. Jewett.

Some of the articles give specific advice on organizing a research laboratory: type of equipment, kind of man to employ, liaison between factory and laboratory (the hard step to take and the one that has perhaps not received sufficient attention in the development of the American research program); others are philosophical discussions as to the place of research in the modern program.

Perhaps the chapter most interesting to the American Institute of Chemists is that by Maurice Holland, director of the division of engineering and industrial research of the National Research Council. Dr. Holland, under the title "Industrial Research Abroad," gives an admirable survey not only of the actual research framework in the important world powers but also of the effect of each nation's program upon its industrial and political importance or lack of it.

Dr. Holland gives interesting comparisons of the financial and social status of scientists in the various countries. Of England he says:

"The picture of the national organization of research in England would not be complete without at least a passing reference to the social and economic position of the individual scientific worker upon whom this organization is founded. The scientist or academic type of research worker in England occupies a high place in the social stratum. . . . . The social position of the scientist or research worker in America is less important than in England. Economically, however, his position

in America is higher, since the rewards of applied science are recognized by industry with higher salaries."

In ascribing the pre-war German preeminence in science largely to the encouragement given by the government, with the consequent superior German organization, rather than to superior German scientific intelligence, he helps to overthrow the myth that German technical advances must necessarily in the end surpass those of America, which is now admittedly in the lead.

Dr. Holland sounds a warning, however, when he says: "The significant difference between research in Germany and America, viewed nationally, is that in general German research is more fundamental, academic, and basic in the building of a solid foundation for industrial technology, whereas in America we have excelled in industrial application and commercial exploitation of the fruits of research." Obviously, America cannot maintain her superiority by the continued adaptation of other people's research in fundamental science.

Another chapter, by William Spraragen, on "Trade Association Research," discusses one of the most vital and at the same time troublesome problems now before American industry.

From the very nature of research, what is now an important issue will be in a few years a settled fact. Even the great names of present-day industry will before long be honored symbols of a regime which by that time will be out-moded. This book on research is therefore appropriately published on what is almost pulp paper, which has the additional advantage of being easy to read, especially with the large type and heavy leading which make the pages, in the popular twenty-three pica width, seem still narrower and more convenient.

J. F. K.

OUR AUTHORS

Explodes Superstition

J. Mitchell Fain took the six-year chemical engineering course at Columbia, part of the time on a Pulitzer scholarship, and was graduated in 1923. After eight years in industry as a research chemist, he returned to Columbia for his Ph.D., which was awarded in 1932.

Tall, energetic, Dr. Fain is known for his alert, inquisitive mind. His hobbies are tennis and boating. A member of Sigma Xi, he is also affiliated with the American Institute of Chemical Engineers and the American Electrochemical Society. He is a captain in the Chemical Warfare Reserve Corps.

Home Economist

Ruth O'Brien earned her bachelor's and master's degrees at the University of Nebraska and did two additional years of graduate work at the University of Chicago. She also holds an LL.B. from George Washington University.

After leaving Chicago Miss O'Brien taught textile chemistry at Iowa State; and she was made chief of the Division of Textiles and Clothing in the U. S. Bureau of Home Economics in 1924. She is a member of both Phi Beta Kappa and Sigma Xi, as well as of a number of scientific organizations. Her chief hobby is dogs.

Dental Chemistry

R. B. Savin spent his first ten years with the White Company in the engineering department. He then went into sales work, later became production manager, and for the past nine years has been advertising manager and business manager of the S. S. White monthly publication, *The Dental Cosmos.*

Founded in 1844 by Dr. Samuel S. White, the company now has two factories in Philadelphia and one in Staten Island, as well as subsidiary companies in London, Paris, Toronto, Rio de Janiero, and Sydney. The research laboratory is in Philadelphia and is in charge of Walter S. Crowell, a chemical engineer.

Chemistry at Vassar

Mary Landon Sague, herself a former Vassar undergraduate, is now professor of chemistry and chairman of the department. She is a member of Sigma Xi, as well as of the A.C.S., the American Association for the Advancement of Science, and the Biochemical Society.

Dr. Sague's favorite sport is riding, though she also likes to swim and play golf. Another hobby is gardening. She is a member of the Garden Club of Poughkeepsie.

Chemical Reports

William C. Dumas, F.A.I.C., is interested in many subjects; but he is particularly interested in a satisfactory form for consultants' reports because he is owner and operator of The Dumas Laboratories, an enterprise he began after a number of years as state chemist of Georgia. He studied at Georgia Tech, becoming a full-fledged rambling wreck in 1906.

Vigorous and active, Mr. Dumas has an inquisitive and scholarly mind. He likes good literature and sports also (particularly those he can enjoy outdoors). His hobbies are horticulture and motoring. He has an intense dislike for saxophones, crooners, and jazz.

Licensing Chemists

Edward Gudeman, Ph.D., F.A.I.C., did his undergraduate work at Columbia and continued his studies in Berlin and Goettingen. He has been in the chemical profession for thirty-five years, specializing in industrial and legal chemistry.

Theory and Practice

Jerome Alexander, F.A.I.C., received his M.S. from C.C.N.Y. in '99. After 25 years in companies manufacturing glues, gelatins, starch products, sizing, finishes, colors, and technical specialties, he went into business for himself and has been a consultant for the last ten years.

Mr. Alexander is a chemist of wide intellectual interests, which include Egyptology, philology, music, art, cooking, folklore. The author of *Colloid Chemistry* and *Glue and Gelatin*, he is also editor and part author of *Colloid Chemistry, Theoretical and Applied*, and he is a contributor to four other well-known books, including *Industrial Chemistry*, by Dr. Allen Rogers, F.A.I.C.

Mr. Alexander is a member of Phi Beta Kappa and of many scientific societies, and he was decorated by the French Government as Officier de l'Instruction Publique. His clubs are the Chemists' (New York) and the Authors' (London). His favorite sport was formerly tennis, but he now gets most of his exercise from trips in search of biological and chemical specimens.

Biographer

Leon V. Quigley, F.A.I.C., received his bachelor's and master's degrees from Worcester Polytech, where the secretary of the faculty commented that he "possessed the viewpoint of a liberal arts graduate as well as that of the engineer." After experience as a chemical assistant in the retail and wholesale drug business, he became instructor in chemistry at Worcester. His experience in contributing special articles to the newspapers of New England and New York led him into public relations. Organizer and for seven years director of the public relations and technical publicity of the Bakelite Corporation from 1925 to 1932, he established his own business as public relations counsel in January, 1932.

Mr. Quigley is a member of many scientific organizations, in which, thanks to his organizing and speaking ability, he has generally held office. He was secretary of the New York Chapter of The American Institute of Chemists.

His favorite recreations are the piano and driving dodge'em tubs in amusement parks. He hates exaggeration and unsubstantiated ballyhoo. Until he had won about 35 contests, including the John Hancock national literary contest in 1922, based on one of Edison's questionnaires, he did not think he could write. His clubs are The Chemists' and Town Hall.

Fertilizer Chemist

Alexander H. McDowell, F.A.I.C., has had wide experience in industrial work with the General Chemical Company, the Du Pont Company, and with several fertilizer companies. He is now working toward a Ph.D. at Michigan.

Tall, slender, with an active, incisive mind, Mr. McDowell is particularly happy in productive work. His chief hobby is reading.

INSTITUTE NOTES

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National Council

The ninety-fifth meeting of the council of The American Institute of Chemists was held at The Chemists' Club on Thursday, October 20, 1932. President Henry G. Knight presided, and the following councilors and officers were present: Messrs. Brooks, Crossley, Jackson, Kenney, Moody, Morgan, Neiman, and Zons. Mr. Edward L. Gordy, editor of THE CHEMIST, was also present.

Chairman D. D. Jackson reported for the membership committee. The question of increasing the membership of the Institute was discussed at length, and the membership committee was requested to consider the various suggestions made during the discussion.

The Secretary presented a letter from the Washington Chapter relative to Civil Service Commission list No. 45, in which it was stated that a position was open for a junior chemist at an annual salary of $1440. Upon motion made and seconded, the Secretary was directed to communicate with the U. S. Civil Service Commission relative to the matter.

The Secretary presented a letter from R. D. Cool requesting information as to whether Article 11 of the Code of Ethics referred to appointment fees or commissions for placements made through regular employment agencies in which commission fees are charged; and the Secretary was requested to write Mr. Cool that this article of the Code of Ethics does not apply to positions thus obtained.

Upon motion made and seconded the Treasurer was authorized to pay bills approved by the Secretary, if within the budget estimate.

The resignations of Robert H. Bogue and James Toy were accepted with regret.

The question of the present qualifications for Fellowship as set up in the Constitution was discussed, and it was the consensus of the councilors present that the present wording clearly indicates that the educational qualifications can be waived by action of the Council.

Pennsylvania Chapter

A meeting of the chapter was held at the Harrison Laboratory of the University of Pennsylvania on Tuesday, October 4th. The meeting was addressed by Dr. Arno Viehover, professor of biology and pharmacognosy and director of microanalytics at the Philadelphia College of Pharmacy and Science. The lecture, which was illustrated by lantern slides, was on "Living Materia Medica."

Dr. Viehover explained his methods for the study of the physiologic effect of drugs by observations on transparent organisms.

E. F. Cayo, chairman of the chapter, presided. The meeting was preceded by a dinner at the Christian Association building of the University of Pennsylvania.

New Members

The following members were elected at the October 20th meeting of the National Council:

FELLOWS

NICHOLAS BACON, *Chemist*, William M. Grosvenor, 50 East 41st Street, New York, N. Y.

MISS AÏDA M. DOYLE, *Chemist*, U. S. National Museum, Washington, D. C.

COLIN G. FINK, *Professor of Chemical Engineering*, Columbia University, New York, N. Y.

LESLIE G. JENNESS, *Assistant Research Director*, Intermetal Corporation, 251 Doremus Avenue, Newark, N. J.

AUGUST MERZ, *Vice-President*, Calco Chemical Company, Bound Brook, N. J.

ALLAN F. ODELL, *Chemical Director*, Du Pont Viscoloid Company, Arlington, N. J.

HAROLD WILLIAM PAINE, *Assistant Chemical Director*, Du Pont Viscoloid Company, Arlington, N. J.

ROBERT LOYAL PERKINS, *Research Group Leader*, National Aniline and Chemical Company, Buffalo, N. Y.

LINCOLN M. SHAFER, *Research Chemist*, Calco Chemical Company, Bound Brook, N. J.

GLEN M. SMYTH, *Research Chemist*, Calco Chemical Company, Bound Brook, N. J.

DAVID LAZARE TCHORNI, *Research Chemist*, Calco Chemical Company, Bound Brook, N. J.

WILLIAM DE GARMO TURNER, *Assistant Professor*, Columbia University, New York, N. Y.

BYRON L. WEST, *Research Chemist*, Calco Chemical Company, Bound Brook, N. J.

LINCOLN THOMAS WORK, *Assistant Professor*, Columbia University, New York, N. Y.

ASSOCIATES

MARTIN M. BURGER, *Junior Chemist*, Department of Public Works, Room 2125, Municipal Bldg., New York, N. Y.

ELMORE HATHAWAY NORTHEY, *Research Chemist*, Calco Chemical Company, Bound Brook, N. J.

MARGUERITE M. SCHMIDT, *Graduate Student*, Johns Hopkins University, Baltimore, Md.

Applications for Membership

FELLOWS

WILLIAM BERNARD ANDERSON, *Research Chemist*, Titanium Pigment Co., Inc., 105 York Street, Brooklyn, N. Y.

ANTHONY WILLIAM DELLER, *Patent Lawyer*, 67 Wall Street, New York, N. Y.

GUSTAV EGLOFF, *Director of Research*, Universal Oil Products Co., Strauss Building, Chicago, Ill.

FREDERIC STEARNS GRANGER, *Chemist*, William M. Grosvenor, 50 East 41st Street, New York, N. Y.

CHARLES JEROME HOLLAND, *Patent Attorney*, 420 Lexington Avenue, New York, N. Y.

DAVID HOUGHTON JACKSON, *Chemical Engineer*, Croll-Reynolds Engineering Co., 17 John Street, New York, N. Y.

EDWARD S. JOHNSON, *Research Chemist*, 84 Dover Road, Wellesley, Mass.

HAROLD T. LACEY, *Research Chemist*, Calco Chemical Company, Bound Brook, N. J.

CHARLES W. MACFARLANE, *Consulting Chemist*, Oaks, Montgomery Co., Pa.

ISADOR MILLER, *Chemist*, William M. Grosvenor, 50 East 41st Street, New York, N. Y.

THOMAS JACKSON POTTS, *Chemist*, William M. Grosvenor, 50 East 41st Street, New York, N. Y.

WILLIAM ALVAH SMITH, *Manager Gasoline and Oil Departments*, Larkin Co., Inc., 680 Seneca Street, Buffalo, N. Y.

ASSOCIATES

HUGH VINCENT ALESSANDRONI, *Research Chemist*, Titanium Pigment Co., Inc., 105 York Street, Brooklyn, N. Y.

KENNETH GROVES CHESLEY, *Chemist*, Mineola, Kansas.

LOUIS W. GATES, *Research Chemist*, Lehn and Fink, 194 Bloomfield Ave., Bloomfield, N. J.

THEODORE A. GEIGER, *Research Chemist*, Pilot Laboratories, Carlstadt, N. J.

WILLIAM M. GROSVENOR, JR., *Research Chemist*, 242 East 19th Street, New York, N. Y.

CECIL ARTHUR SPENCER, *Research Chemist*, Calco Chemical Co., Inc., Bound Brook, N. J.

JUNIORS

FRANK ELLIS ELDER, *Student*, 820 S. Stanislaus Street, Stockton, Calif.

STUDENT MEMBERS

WILLIAM ROSE, *Student*, 4673 188th Street, Flushing, N. Y.

CARL GROTHUES, *Assistant Chemist*, William M. Grosvenor, 50 East 41st Street, New York, N.Y.

NEWS

Publications by Members

In the Analytical Edition of *Industrial and Engineering Chemistry*, October 15, 1932:

J. S. McHargue, F.A.I.C., and **R. K. Calfee:** "Determination of Boron Spectroscopically."

Warren A. Cook and **Joseph B. Ficklen,** A.A.I.C., "Determination of Benzene in Solvent Mixtures."

William M. Dehn, Kirby E. Jackson, F.A.I.C., and **Donald A. Ballard:** "Identification of Common Carbohydrates."

Morris B. Jacobs and **Leon Jaffe,** F.A.I.C., "Detection of Gelatin in Dairy Products."

Irving Lorge, Louis Sattler, F.A.I.C., and **F. W. Zerban,** F.A.I.C., "Functional Relationship between Ash Content and Electrical Conductance of Can Sirups and Molasses."

Oil and Soap, October, 1932:

H. P. Trevithick, F.A.I.C., and **M. F. Lauro:** "The Technology of Palm Oil."

Chemical Markets, September, 1932:

Charles E. Mullin, F.A.I.C., "The Chemical Markets of Asia."

Frances Krasnow, F.A.I.C., for 15 years with the department of biological chemistry at the College of Physicians and Surgeons, Columbia University, has joined the staff of the School for General Hygienists, Guggenheim Dental Clinic. She will conduct courses in research in biochemistry, bacteriology, and related subjects.

T. C. Poulter, head of the department of physics at Iowa Wesleyan, is to be the physicist on the staff of Admiral Byrd on his next trip to the South Pole.

Young Scientists Meet

The Junior Science Clubs of the American Institute, a new organization representing over six thousand young people interested in science, held its first demonstration meeting on Saturday,

H. H. SHELDON

October 29th, at the American Museum of Natural History with Dr. H. H. Sheldon presiding.

Dr. Oscar Riddle, a member of the research staff of the Carnegie station for experimental evolution at Cold Spring Harbor, was the first speaker. In his address on "Biology Tomorrow," Dr. Riddle pointed out that "while the immediate and very personal problem of the cave man was to avoid being devoured by other highly developed living things, that of the civilized masses of tomorrow is nothing less than the understanding

and control of the many life-processes of organisms generally—including even the life of the invisible microscopic world."

Dr. Ross A. Baker, F.A.I.C., professor of chemistry at C.C.N.Y. in "Chemistry Today and Tomorrow" gave a glimpse around the corner showing, from the basis of our present knowledge, what we may expect of chemistry in the future. He also performed experiments to illustrate the effect of temperature and concentration on the rate of chemical action.

Dr. John A. Clark, chairman of the department of physics of the Alexander Hamilton High School, spoke on "Advice to Pupil Experimenters in Physics."

The Junior Science Clubs were recently formed by the American Institute in order to coordinate and assist science clubs of young people throughout the city. Over two hundred school and other clubs have so far been registered. Among the activities are demonstration programs by prominent scientists, of which Saturday's was the first. In these programs the Institute aims to place before the young scientist some perspective of the place of science in modern life. Its plan is not only to assist science pupils in their present school and club work, but to equip them with an understanding of the possibilities of scientific achievement in the future.

Nao Uyei, F.A.I.C., formerly engaged in biochemical research with Dr. George A. Wyeth, will spend the coming year in Germany studying chemistry in its relation to medical subjects.

D. H. Jackson addressed the Association of Textile Chemists and Colorists on September 23rd on "Vacuum Refrigeration."

W. D. Vaughn has received an additional leave of absence from Chicago University to continue work on a national research fellowship. He will spend the coming year at California Institute of Technology working on thermal reaction rates under the supervision of Professor Tolman.

Brazil's Chemical Buying

Practically dependent on outside sources before the war for its requirements of chemicals and allied products, Brazil today produces more than half of its consumption of these commodities, according to a bulletin just issued by the Commerce Department.

The development of the domestic industry has been retarded by a number of factors, including insufficient native raw materials, lack of technicians and skilled labor, an inadequate internal transportation system, high manufacturing costs and sharp foreign competition. On the other hand, domestic production has been markedly favored by fluctuating exchange, by the provisions of the Brazilian customs regulations, and by the establishment in the country of branch plants of foreign chemical interests.

In 1928 Germany supplanted the United States as the leading foreign shipper of chemicals to Brazil and has since maintained this position. The United Kingdom ranks third and France fourth as a source of supply.

J. F. X. Harold, F.A.I.C., is the author of the chapter on "Chemical Analysis" in *Textile Research,* the new survey of progress published by the U. S. Institute for Textile Research.

Ralph Wechsler, F.A.I.C., technical director of the National Oil Products Company, has returned from a two months' trip to Europe.

Charles H. LaWall, F.A.I.C., is the author of two recent articles in *The American Journal of Pharmacy*: "The History and Romance of Bread" and "Caffeine in Cereal Beverages."

Aid to Agriculture

In an article in the *Pennsylvania Manufacturers' Journal* entitled, "Prosperity, Prohibition, Farm Relief, and Unemployment," **Henry Arnstein,** F.A.I.C., suggests putting alcohol in gasoline as a solution of the problem of the oversupply of American farm products.

In discussing the prohibition law Dr. Arnstein quotes the illustrations used by **M. C. Whitaker,** F.A.I.C., to show the absurdity of some interpretations of the law:

1. The general counsels of the telephone companies of Boston and Baltimore advised their clients that it would be illegal to list the name "United States Industrial Alcohol Company" in the phone book.

2. E. B. Badger & Sons, of Boston, manufacturers of distillation equipment, were told by a clerk in a local bookstore that it would be illegal to sell them a copy of Young's "Fractional Distillation."

3. The agents of a steamship line at Baltimore refused to receive an export shipment of isobutyl alcohol, which had to be re-labeled "isobutyl solvent," greatly confusing the foreign consignees.

Chemists' Club Bridge

The Chemists' Club has instituted a series of duplicate bridge tournaments, to consist of eight sessions, with a cup presented by President George C. Lewis as the prize for the high individual scorer at the end of the year. High-score cups are also awarded to the members of the winning North-South and East-West teams in each evening's play.

The tournament, begun as an experiment, has proved successful beyond the expectations of the promoters. At the first session, on October 5th, fifty-six members and guests took part; and this number was increased to sixty-eight for the second session, on November 2nd.

The tournaments are under the direction of Foster D. Snell, F.A.I.C., and are part of the general entertainment program of the committee headed by Howard Farkas.

Frederick G. Keyes, professor of physical chemistry at Massachusetts Tech, was presented with the military decoration of the Purple Heart on September 10th at a dinner at the Harvard Faculty Club.

J. Stogdell Stokes has been elected a director of the Pennsylvania Salt Company.

A Correction

R. A. Miller, author of the article on "Chemistry in Glass Manufacture" in THE CHEMIST for October, was incorrectly described as the sales manager of the Pittsburgh Plate Glass Company. Mr. Miller's actual position is that of technical sales engineer.

Olive M. Lammert, professor of chemistry at Vassar, died of a heart attack while seated at her desk in the chemistry laboratory on the night of October 10th. She had been in ill health for several days.

Dr. Lammert was graduated from Vassar and did graduate work at the University of Chicago. She was a Fellow of the American Association for the Advancement of Science, and had been a member of the chemistry faculty at Vassar since 1915.

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